

ความรอบรู้ด้านโภชนาการของผู้ปกครองและความสัมพันธ์กับภาวะโภชนาการของเด็ก
ในภาคตะวันออกเฉียงเหนือของประเทศไทย: การศึกษาแบบภาคตัดขวาง
Parental Nutritional Literacy and Its Association with the Nutritional Status of
Children in Northeastern Thailand: A Cross-Sectional Study

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บทคัดย่อ

การศึกษาวิจัยเชิงพรรณนาแบบตัดขวางนี้มีวัตถุประสงค์เพื่อประเมินความรู้ความเข้าใจด้านโภชนาการของผู้ปกครองแยกตามเพศ และตรวจสอบความสัมพันธ์ระหว่างความรู้ความเข้าใจด้านโภชนาการกับภาวะโภชนาการของเด็กวัยเรียนในจังหวัดสกลนคร ประเทศไทย ดำเนินการในผู้ปกครองและเด็กจำนวน 414 คู่ โดยใช้การสุ่มตัวอย่างแบบหลายขั้นตอน เครื่องมือที่ใช้ประเมินความรอบรู้ด้านโภชนาการของผู้ปกครองครอบคลุม 6 ด้าน ซึ่งผ่านการตรวจสอบคุณภาพเครื่องมือมีค่าดัชนีความสอดคล้องเท่ากับ .78 และค่าสัมประสิทธิ์แอลฟาของครอนบาคทั้งหมดเท่ากับ .84 และแบบประเมินภาวะโภชนาการของเด็กกำหนดโดยใช้ค่าคะแนนมาตรฐานดัชนีมวลกายตามเกณฑ์อายุ (BMI-for-age z-scores: BAZ) วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา และสถิติถดถอยโลจิสติกแบบพหุตัวแปร ผลการวิจัยพบว่า

ผู้ปกครองร้อยละ 43.48 มีความรอบรู้ด้านโภชนาการที่เพียงพอ โดยผู้ปกครองเพศหญิงมีระดับความเพียงพอในด้านการจัดการตนเองสูงกว่า ในขณะที่ด้านความรอบรู้เท่าทันสื่อเป็นด้านที่คะแนนน้อยที่สุดในทั้งสองเพศ และจากการวิเคราะห์การถดถอยโลจิสติกแบบพหุตัวแปรเผยให้เห็นว่า เด็กที่มีผู้ปกครองที่มีความรอบรู้ด้านโภชนาการระดับไม่เพียงพอ ($AOR = 2.22, 95\%CI: 1.10 - 4.48$) หรือระดับปานกลาง ($AOR = 2.15, 95\%CI: 1.24 - 3.72$) มีโอกาสเกิดผลลัพธ์ทางโภชนาการที่ไม่ดีสูงกว่าอย่างมีนัยสำคัญ นอกจากนี้ยังพบว่าผู้ปกครองที่มีอายุมาก (≥ 51 ปี; $AOR = 2.14$) และเด็กเพศชาย ($AOR = 1.55$) ยังเป็นปัจจัยเสี่ยงที่สำคัญ

ผลการศึกษาครั้งนี้เน้นย้ำถึงช่องว่างระหว่างวัยในความรู้ด้านสุขภาพ และความจำเป็นในการดำเนินการมาตรการที่มุ่งเน้นการเสริมสร้างความรอบรู้เท่าทันสื่อ นโยบายสาธารณสุขควรให้ความสำคัญกับกลยุทธ์ที่ยึดครอบครัวเป็นศูนย์กลางและเหมาะสมกับบริบททางเพศ เพื่อเพิ่มสมรรถนะของผู้ปกครองในการประเมินข้อมูลด้านโภชนาการและบรรเทาภาวะทุพโภชนาการแบบซ้ำซ้อนของประเทศไทย

คำสำคัญ: ความรอบรู้ด้านโภชนาการ ภาวะโภชนาการ เด็กวัยเรียน ข้อมูลทางสังคมและประชากรศาสตร์

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Abstract

This cross-sectional descriptive study aimed to evaluate gender-based differences in parental nutritional literacy and to investigate its association with the nutritional status of school-aged children in Sakon Nakhon Province, Thailand. A total of 414 parent-child dyads were recruited through multistage sampling. Parental nutritional literacy was assessed across six domains using a validated instrument (Item-Objective Congruence index = .78; overall Cronbach's alpha = .84). Children's nutritional status was determined using BMI-for-age z-scores (BAZ). Data were analyzed using descriptive statistics and multivariable logistic regression.

The findings indicated that 43.48% of parents possessed adequate nutritional literacy. Female parents demonstrated significantly higher proficiency in self-management, whereas media literacy was identified as the lowest-scoring domain across both genders. Multivariable logistic regression analysis revealed that children of parents with inadequate ($AOR = 2.22$, 95% CI : 1.10 – 4.48) or moderate nutritional literacy ($AOR = 2.15$, 95% CI : 1.24 – 3.72) had significantly higher odds of poor nutritional outcomes. Furthermore, advanced parental age (≥ 51 years; $AOR = 2.14$) and male gender in children ($AOR = 1.55$) were identified as significant risk factors.

These findings highlight generational gaps in health literacy and a need for media-literacy-focused interventions. Public health policies should prioritize family-centered, gender-tailored strategies to enhance parental appraisal of nutritional information and mitigate Thailand's dual burden of malnutrition.

Keywords: Parental Nutritional Literacy, Nutrition Status, School-aged Children, Sociodemographic

Introduction

The complex dual burden of malnutrition, characterized by the coexistence of undernutrition and overweight, has become increasingly prevalent in low- and middle-income countries (Biswas, Townsend, Magalhaes, Hasan, Mamun, 2021). Thailand exemplifies this global nutritional transition; while stunting has declined, persistent disparities in underweight and obesity signal structural and behavioral challenges (UNICEF Thailand, 2021). In Northeastern Thailand, the urgency is underscored by data showing that nearly 20% of school-aged children are underweight, while obesity rates have surged to over 15% in rural areas, surpassing national averages (Health Data Center, Sakon Nakhon Provincial Public Health Office, 2025; Aekplakorn, 2021). This malnutrition places a significant economic burden on rural Thai families due to increased healthcare costs and lost productivity, further exacerbating the cycle of poverty and poor health (Janpeang, Suwannapoom, Anukunwathaka, 2022).

In Sakon Nakhon province, childhood nutrition surveillance reveals a critical gap: only 49.3% of children achieve growth requirements, far below the 68% national target (Health Data Center, Sakon Nakhon Provincial Public Health Office, 2025). Within this rural context, nutritional literacy (NL) has emerged as a vital link between household resources and child health (Omidvar, Doustmohammadian, Shakibazadeh, Clark, Kasaii, Hajigholam-Saryazdi, 2023). Anchored in Nutbeam's health literacy model, PNL encompasses functional (accessing information, knowledge

and understanding), interactive (Communication Skills, Self-management Capabilities, Decision-making Processes), and critical (Media Literacy) domains (Carroll, Perreault, David, Ma, Haines, 2021; Nutbeam, 2000). Each domain is hypothesized to influence child BMI through distinct pathways: communication skills facilitate effective dialogue about healthy eating, while self-management and media literacy enable parents to appraise food marketing and maintain healthy home food environments (Costarelli, Michou, Panagiotakos, Lionis, 2022; Pathan, Yangyuen, Somdee, 2025). Thus, PNL serves as the foundational competency for caregivers to mitigate nutritional risks.

Despite the established role of PNL in international settings (Bozbulut, Ertaş-Öztürk, Döğər, Bideci, Köksal, 2020), little is known about how these specific literacy domains affect child nutritional status within the evolving Thai food environment. Current local research has focused primarily on general health literacy, often overlooking the critical role of media evaluation and decision-making skills in rural households undergoing urbanization (Mungvongsa, Yangyuen, Jareanpon, Somdee, 2023; Wedchakama, Areemit, 2025). This lack of context-specific evidence represents a significant research gap that hinders the design of family-centered policies. Addressing this gap is essential for developing interventions that go beyond factual knowledge to empower caregivers in everyday dietary decision-making. This study therefore aimed to assess parental nutritional literacy and examine its association with the nutritional status of school-aged children in Sakon Nakhon province, Thailand. These findings will provide a framework for tailored, family-centered interventions designed to improve long-term nutritional health in rural populations.

Objective

The study aimed to assesses parental nutritional literacy classified by gender and examine its association with the nutritional status of school-aged children in Sakon Nakhon province, Northeastern Thailand.

Conceptual Framework

The nutritional status of school-aged children is a complex outcome influenced by multifaceted factors, primarily parental nutritional literacy, alongside sociodemographic and health-related determinants. Grounded in Nutbeam's Health Literacy Model (2000) and a comprehensive review of relevant literature, these variables have been integrated into a research conceptual framework, as illustrated in Figure 1.

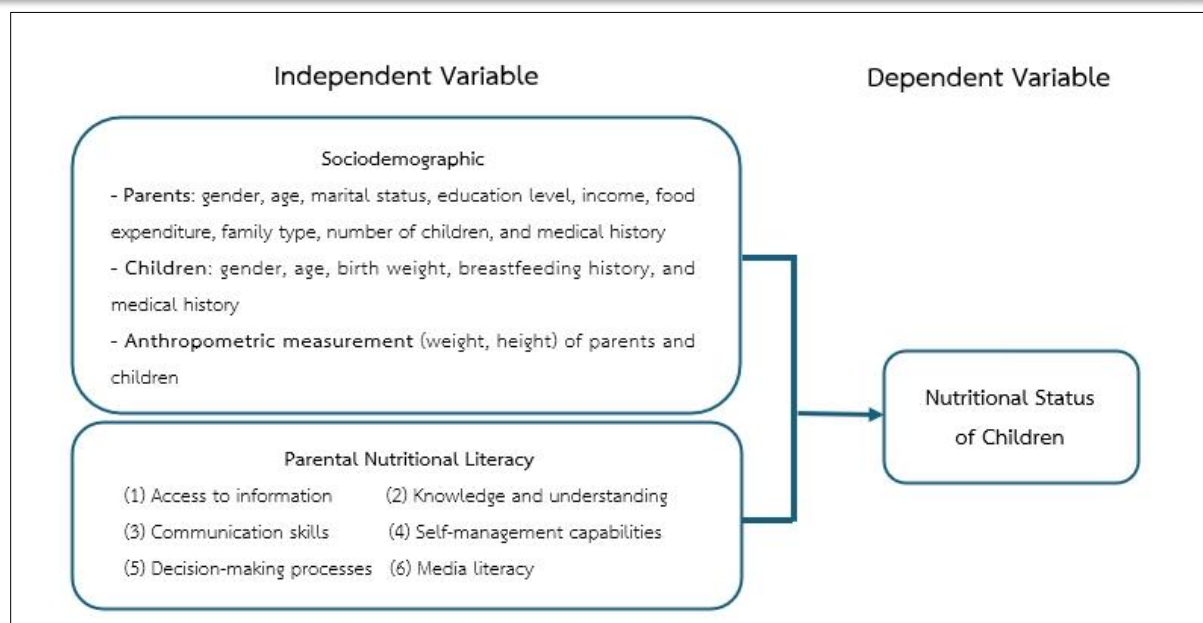


Figure 1 Conceptual Framework

Methods

A cross-sectional study was conducted between April and June 2024 in Sakon Nakhon province, located in northeastern Thailand.

Population and Sample

Population

The study population comprised parent-child pairs residing in Sakon Nakhon province, Northeastern Thailand. Eligibility was determined based on the following inclusion criteria: (1) school-aged children 6 - 12 years old; (2) parents or primary food gatekeepers (including fathers, mothers, or non-biological guardians, such as grandparents) aged 18 years or older residing in the study area; (3) parents and their children being able to read, write, and speak Thai; and (4) the willingness to provide informed consent. Conversely, exclusion criteria were applied to children with chronic growth conditions identified via parental self-reports as well as parents unable to provide comprehensive data or those with significant Thai language communication barriers.

Samples and Sampling

The sample size was computed using n4Studies (version 1.4) software, which is designed for estimating an infinite population proportion (Ngamjarus, Pattanittum, 2024). The calculation was based on the following parameters included an estimated 37.6% prevalence of inadequate nutritional literacy (Aygun, Topcu, 2023), indicating 80% power with $\alpha = .05$. The initial minimum sample size was 360 pairs. After accounting for a 15% dropout rate, the final required sample size was determined to be 414 parent-child pairs.

A multistage random sampling technique was employed to select the 414 participants according to the following stages: stage 1: three districts were selected from the 18 districts of Sakon Nakhon province via simple random sampling without replacement. Stage 2: three sub-districts were randomly selected from each chosen district. Subsequently, one school per sub-

district was selected, resulting in a total of nine participating schools. Stage 3: to ensure a balanced distribution, an equal number of participants (46 parent-child pairs per school) was targeted to reach the final sample size. Students were selected from the rosters of each school using a random number table. Each student was assigned a unique three-digit code; those whose codes matched the drawn number were included in the study group until the required 414 parent-child pairs were reached.

Research Instruments

The questionnaire was developed based on an extensive literature review and underwent a rigorous validation process. The self-reported questionnaire comprised two primary sections:

Part 1: Sociodemographic and anthropometric characteristics: Parental sociodemographic data and child-specific health histories were collected. For anthropometric assessments, children's weight and height were measured following World Health Organization (2006) guidelines using calibrated digital scales and standardized stadiometers. To ensure measurement precision and minimize technical error, trained research assistants conducted all measurements in duplicate, and the average of two readings was recorded. Equipment was calibrated daily to the nearest 0.1 kg (weight) and 0.1 cm (height). Nutritional status was categorized using Asian-specific BMI classifications (World Health Organization, 2004) for parents were applied: underweight (<18.5 kg/m²), normal weight (18.5-22.9 kg/m²), overweight (23.0-24.9 kg/m²), and obesity (≥ 25.0 kg/m²). Children's anthropometric data were collected following World Health Organization (2006) guidelines. The BMI-for-age z-score (BAZ) was the applied to categorize nutritional status are as follows: underweight (BAZ <-2 SD), normal weight (-2 to $<+1$ SD), overweight ($+1$ to $<+2$ SD), and obesity ($\geq +2$ SD).

Part 2: The Parental Nutrition Literacy (PNL) Questionnaire: The PNL questionnaire was adapted from the conceptual framework of Deesameer, Piaseu, Maneesriwongul, Orathai, Schepp (2020) and comprised 46 items categorized into six domains: access to information (7 items), knowledge and understanding (5 items), communication skills (10 items), self-management capabilities (11 items), decision-making processes (6 items), and media literacy (7 items). All items were measured on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The instrument demonstrated excellent internal consistency, with each domain-specific coefficient of .89, .87, .94, .95, .92, and .90, respectively. PNL levels were categorized into inadequate ($<60\%$), fair (60-74.9%), and adequate ($\geq 75\%$) based on the total percentage scores. This categorization follows the established scoring criteria utilized in previous Thai nutrition literacy research (Deesameer, Piaseu, Maneesriwongul, Orathai, Schepp, 2020; Chinnamart, 2024), ensuring consistency with validated regional assessment standards.

Validity and Reliability of the Research Instrument

The research instrument was validated by three experts in nutrition and public health, yielding an Item-Objective Congruence (IOC) index of .67 – 1.00. The overall reliability of the instrument was confirmed with a Cronbach's alpha coefficient of .84.

Data Collection

The data collection was conducted from April to June 2024 across nine primary schools in Sakon Nakhon province, following ethical approval. After obtaining administrative clearance and written informed consent from participants, data were gathered through structured self-administered questionnaires (30 - 45 minutes) and direct anthropometric measurements (Weight and Height). To ensure high data quality and minimize measurement bias, all research assistants underwent standardized training before the field study. Measurements were performed using calibrated equipment, and only verified, complete datasets were included for subsequent statistical analysis.

Data Analysis

Statistical analyses were performed with STATA version 14.0. The normality of continuous variables was assessed using the Shapiro-Wilk test. For normally distributed data, descriptive statistics were reported as means, and standard deviation (SD), while non-normally distributed data were summarized using medians and interquartile ranges (IQR). Categorical variables, including sociodemographic characteristics, PNL levels, and nutritional status, were reported as frequencies and percentages. For the inferential analysis, univariate logistic regression was initially used to estimate the association between each independent variable and children's nutritional status. Variables with $p\text{-value} < .25$ in the univariate analysis were subsequently entered into a multivariate logistic regression (MLR) model to control for potential confounders. For the MLR analysis, children's nutritional status was dichotomized into "Normal" and "Poor" (Encompassing both Undernutrition and Overnutrition), following the standardized growth surveillance criteria of the Bureau of Nutrition, Department of Health, Ministry of Public Health, Thailand (2020). Results were reported as an adjusted odd ratio (AOR) with 95% confidence intervals (CI), and statistical significance was set at $p\text{-value} < .05$.

Ethical Considerations

This study was approved by the Kasetsart University Research Ethics Committee (COA No. COA66/018; Approval date: 02 February 2024, Approval expiry date: 01 February 2025).

Results

1. Sociodemographic and Anthropometric Characteristics of Parents and Children

Table 1 Sociodemographic and anthropometric characteristics of both parents and children (n = 414).

Variables		n (%) or Median (IQR)		
		Total	Men	Women
<i>Parent's variables</i>	Gender	414 (100)	68 (16.43)	346 (83.57)
	Age (Years): Median (IQR)	42 (14.00)	44 (15.25)	42 (13.00)
	Marital status	Single	19 (4.59)	96 (23.19)
		Married	49 (11.84)	250 (60.39)
	Education level	Primary education	21 (5.07)	102 (24.64)
		Secondary education	21 (5.07)	110 (26.57)

Variables		n (%) or Median (IQR)		
		Total	Men	Women
Occupational	Diploma/Higher Vocational Certificate	54 (13.04)	8 (1.93)	46 (11.11)
	Bachelor's degree or higher	106 (25.61)	18 (4.35)	88 (21.26)
	Unemployed	56 (13.53)	6 (1.45)	50 (12.08)
	General laborer / Farmer	213 (51.45)	37 (8.94)	176 (42.51)
	Self-employed business owner	62 (14.98)	7 (1.69)	55 (13.29)
	Government official	83 (20.05)	18 (4.35)	65 (15.70)
	Income (Baht): Median (IQR)	9,000 (15,000)	10,000 (16,640)	9,000 (15,000)
Food expenditure (Baht): Median (IQR)		5,000 (4,000)	5,000 (5,000)	5,000 (4,000)
Types of family	Nuclear family	255 (61.59)	46 (11.11)	209 (50.48)
	Extended family	159 (38.40)	22 (5.31)	137 (33.09)
Number of children of the parent	1	274 (66.19)	44 (10.63)	230 (55.56)
	More than 1	140 (33.81)	24 (5.79)	116 (28.02)
Congenital disease	No	305 (73.67)	52 (12.56)	253 (61.11)
	Yes	109 (26.32)	16 (3.86)	93 (22.46)
BMI	Underweight	20 (4.83)	5 (1.21)	15 (3.62)
	Normal weight	148 (35.75)	28 (6.76)	120 (28.99)
	Overweight	80 (19.33)	12 (2.90)	68 (16.43)
	Obesity	166 (40.10)	23 (5.56)	143 (34.54)

Variables		n (%) or Median (IQR)		
		Total	Boy	Girl
Children's variables	Gender	414 (100)	193 (46.62)	221 (53.38)
	Age (Years): Median (IQR)	10 (2.00)	10 (3.00)	10 (2.00)
	Birth weight	≥ 2,500 g	354 (85.50)	171 (41.30)
		< 2,500 g	60 (14.49)	22 (5.31)
	Breastfeeding	< 6 months	130 (31.40)	66 (15.94)
		≥ 6 months	284 (68.60)	127 (30.68)
	Illness in the past month	No	342 (82.61)	161 (38.89)
		Yes	72 (17.39)	32 (7.73)
	Congenital disease	No	363 (87.68)	170 (41.06)
		Yes	51 (12.31)	23 (5.55)
	BMI-for-age	Underweight	58 (14.01)	33 (7.97)
	z-scores	Normal weight	286 (69.08)	121 (29.22)
		Overweight	51 (12.31)	28 (6.76)
		Obesity	19 (4.59)	11 (2.66)

This cross-sectional study involved 414 parent-child pairs. As shown in Table 1, the majority of parent participants were women (83.57%), with a median age of 42.00 years. Most parents were married (72.23%) and lived in nuclear families (61.59%). Educational attainment was relatively diverse: 31.64% completed secondary school, 29.71% primary school, and 25.61% held a bachelor's degree or higher. Occupationally, more than half were general laborers or farmers (51.45%), followed by government officials (20.05%) and self-employed business owners (14.98%). The median monthly income was 9,000 baht (IQR: 15,000), with a consistent median monthly food expenditure of 5,000 baht across both genders. Regarding health status, 26.32% of parents reported

having a congenital disease, and notably, 59.43% were classified as either overweight (19.33%) or obese (40.10%).

Among the 414 school-aged children, 46.62% were boys and 53.38% were girls, with a median age of 10.00 years. Most children had a normal birth weight ($\geq 2,500$ g; 85.50%) and more than two-thirds (68.60%) were breastfed for 6 months or longer. Health data indicated that 17.39% had been ill in the past month and 12.31% had congenital diseases. Nutritional status based on BMI-for-age z-scores revealed a significant dual burden of malnutrition: while 69.08% had a normal weight, 30.90% experienced nutritional imbalances, comprising 14.01% underweight and 16.90% overweight or obese (12.31% overweight and 4.59% obese, respectively).

2. Parental Nutritional Literacy (PNL) Levels

Table 2 Parental nutritional literacy levels across six domains (n = 414).

Nutritional Literacy Domain	Adequate, n (%)		Fair, n (%)		Inadequate, n (%)	
	Men	Women	Men	Women	Men	Women
Access to information	25 (6.04)	147 (35.51)	29 (7.01)	129 (31.16)	14 (3.38)	70 (16.91)
Knowledge and understanding	30 (7.25)	199 (48.07)	26 (6.28)	94 (22.71)	12 (2.90)	53 (12.80)
Communication skills	21 (5.07)	128 (30.92)	30 (7.25)	138 (33.33)	17 (4.11)	80 (19.32)
Self-Management capabilities	35 (8.45)	218 (52.66)	20 (4.83)	84 (20.29)	13 (3.14)	44 (10.63)
Decision-making processes	22 (5.31)	139 (33.56)	32 (7.73)	143 (34.54)	14 (3.38)	64 (15.46)
Media literacy skills	20 (4.83)	113 (27.30)	39 (9.42)	164 (39.61)	9 (2.17)	69 (16.67)
Overall	180 (43.48)		159 (38.41)		75 (18.12)	

Overall, 43.48% of parents demonstrated adequate NL, 38.41% had fair NL, and 18.12% were categorized as inadequate NL. Women consistently demonstrated higher nutritional literacy, particularly in self-management capabilities, which showed the highest adequacy (52.66% in women vs. 8.45% in men). Conversely, media literacy skills were identified as the weakest domain for both genders, with fewer than one-third of women (27.30%) and less than 4.83% of men achieving adequacy. Overall, men were significantly overrepresented in the fair and inadequate categories. (Table 2).

3. Relationship between PNL and Children's Nutritional Status

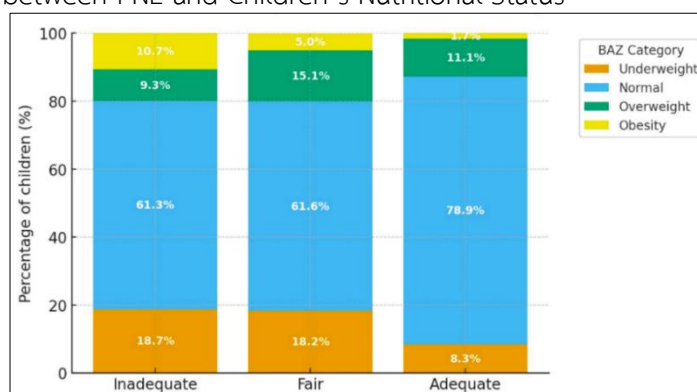


Figure 2 Percentage distribution of children's nutritional status (Underweight, Normal, Overweight, Obesity) within each level of parental nutritional literacy (Inadequate, Fair, and Adequate).

Note: Significant associations were tested using the Chi-square test ($\chi^2 = 23.0$, $df = 6$, $p\text{-value} < .001$).

Figure 2 illustrates a clear gradient between PNL levels and children's BMI-for-age z-score (BAZ) categories. The Chi-square test confirmed that these differences in nutritional status across PNL levels were statistically significant ($p\text{-value} < .001$). Normal weight prevalence peaked at 78.90% among children of parents with adequate PNL, contrasting sharply with approximately 61.0% in the inadequate and fair groups. A striking inverse relationship was observed in malnutrition categories: underweight prevalence in the inadequate PNL group (18.70%) was more than double that of the adequate group (8.30%). Similarly, obesity showed a significant descending trend as literacy increased, dropping from 10.70% in the inadequate group to its lowest point of 1.70% among children of parents with adequate PNL. These results highlight that higher parental literacy is consistency associated with a more favorable nutritional profile and a reduced burden of both under- and overnutrition.

4. Factors associated with Children's Nutritional Status

Table 3 Multivariate logistic regression analysis of factors associated with nutritional status among school-aged children (n = 414).

Variables	Children's nutritional status, n (%)		Crude OR (95%CI)	Adjusted OR (95%CI)	P-value
	Normal (n=286)	Poor (n=128)			
Parental Nutritional Literacy					
Adequate	142 (34.30)	38 (9.18)	1	1	
Fair	98 (23.67)	61 (14.73)	2.33 (1.44-3.76)	2.15 (1.24-3.72)	.004
Inadequate	46 (11.11)	29 (7.00)	2.36 (1.31-4.24)	2.22 (1.10-4.48)	.023
Age of Parental (Years)					
31-40	101 (24.40)	32 (7.73)	1	1	
≤ 30	23 (5.55)	9 (2.17)	1.24 (0.52-2.94)	1.23 (0.49-3.03)	.681
41-50	99 (23.91)	42 (10.15)	1.34 (0.78-2.29)	1.37 (0.79-2.39)	.295
≥ 51	63 (15.21)	45 (10.87)	2.25 (1.29-3.91)	2.14 (1.13-4.04)	.030
Parental BMI					
Normal	114 (27.54)	54 (13.04)	1	1	
Overnutrition	172 (41.55)	74 (17.87)	0.91 (0.60-1.39)	0.93 (0.59-1.45)	.701
Parental Education					
Bachelor's degree or higher	78 (18.84)	28 (6.76)	1	1	
Diploma/Higher Vocational Certificate	43 (10.39)	11 (2.66)	0.71 (0.32-1.57)	0.50 (0.20-1.26)	.195
Secondary education	91 (21.98)	40 (9.66)	1.22 (0.69-2.17)	0.60 (0.26-1.35)	.356
Primary education	74 (17.87)	49 (11.84)	1.85 (1.05-3.24)	0.57 (0.22-1.48)	.441
Gender of Child					
Girl	165 (39.86)	56 (13.53)	1	1	
Boy	121 (29.23)	72 (17.39)	1.75 (1.15-2.67)	1.55 (1.00-2.43)	.049
Age of Child (Years)					
9-10	143 (34.54)	64 (15.46)	1	1	
6-8	61 (14.73)	28 (6.76)	1.03 (0.60-1.75)	0.89 (0.50-1.61)	.779
11-12	82 (19.81)	36 (8.70)	0.98 (0.60-1.60)	1.08 (0.63-1.86)	.857

Variables	Children's nutritional status, n (%)		Crude OR (95%CI)	Adjusted OR (95%CI)	P-value
	Normal (n=286)	Poor (n=128)			
Birth Weight (g)					
≥ 2,500	246 (59.42)	108 (26.09)	1	1	
< 2,500	40 (9.66)	20 (4.83)	1.14 (0.64-2.04)	1.13 (0.60-2.11)	.711
Breastfeeding					
Yes	266 (64.25)	125 (30.19)	1	1	
No	20 (4.83)	3 (0.73)	0.32 (0.09-1.09)	0.29 (0.08-1.02)	.053

Multivariate logistic regression confirmed that parental nutritional literacy, parental age, and child gender remained significantly associated with children's nutritional status after adjusting for potential confounders, such as parental BMI, education, and breastfeeding history (Table 3). Specifically, inadequate and fair PNL levels more than doubled the odds of poor nutritional outcomes compared to adequate literacy (AOR: 2.22, 95%CI: 1.10-4.48 and AOR: 2.15, 95%CI: 1.24-3.72, respectively).

Notably, advanced parental age (≥51 years) was a significant predictor of poorer child nutrition (AOR: 2.14, 95%CI: 1.13 - 4.04). This association likely reflects generation gaps in modern health literacy or differences in caregiving practices compared to younger cohorts, such as parents aged 31 - 40 years. In contrast, parents in the youngest category (≤30 years) showed no significant difference in child outcomes compared to the reference group. Regarding child demographics, boys exhibited higher odds of poor nutritional status than girls (AOR: 1.55, 95%CI: 1.00 - 2.43).

In summary, children of parents with inadequate or fair literacy, older parents, and boys were significantly more likely to have poor nutritional outcomes.

Discussion

Nutritional literacy (NL) is a multifaceted component of health literacy (Li, Zhu, Xu, Ma, 2020), serving as a vital factor in improving nutritional status and preventing chronic nutrition-related disease (Wang, Wu, Shi, He, Hao, Wu, 2023; Omidvar, Doustmohammadian, Shakibazadeh, Clark, Kasaii, Hajigholam-Saryazdi, 2023). This study examined the relationship between parental nutritional literacy (PNL) levels and children's nutritional status in Sakon Nakhon province, Thailand. The findings suggest that PNL was strongly associated with child nutritional status, underscoring its role as a modifiable determinant of pediatric health.

PNL and Child Nutritional Outcomes

The results suggest that PNL was strongly associated with child nutritional status. When compared to adequate literacy, both fair and inadequate PNL were linked to more than twice the likelihood of poor nutritional outcomes (AOR: 2.15 and 2.22, respectively). These findings align with Thai research showing that caregivers' health and nutrition literacy predict young children's nutritional and developmental outcomes (Chinnamart, 2024) and that nutrition education for caregivers improves pediatric weight management (Worakul, 2024). Our data revealed a clear gradient: normal weight prevalence peaked at 78.9% among children of parents with adequate

PNL, while the prevalence of underweight and obesity nearly doubled or tripled in the inadequate group. This confirms that PNL acts as a protective factor across the entire nutritional spectrum, influencing children's health through cognitive processes such as critical appraisal of food choices and modeling behaviors (Costarelli, Michou, Panagiotakos, Lionis, 2022)

Gender Gap and Tailored Interventions

A significant gender disparity was observed, as women demonstrated higher NL levels than men, particularly in communication, self-management, and comprehension (Chinnamart, 2024). Notably, adequacy in self-management was six times higher in women than in men (52.66% vs. 8.45%). This may be because women often act as primary “gatekeepers” responsible for food selection and preparation in Thai rural households (Michou, Panagiotakos, Lionis, Costarelli, 2019). However, the lower NL among men suggests fathers may be underserved by current health platforms. Our findings highlight a critical “gender gap” in communication skills, suggesting that fathers may lack the tools to engage in interactive nutritional decision-making within the family. To address this, gender-specific strategies are necessary, such as workplace-based nutrition programs in male-dominated settings, collaboration with men's community groups, or integrating nutrition content into digital platforms commonly groups, or integrating nutrition content into digital platforms commonly used by men to enhance their role as active caregivers.

Age, Media Literacy, and Nutritional Misinformation

Older parental age (≥ 51 years) was significantly associated with poorer child nutritional status (AOR: 2.14), supporting evidence that older adults may have lower digital literacy and struggle to interpret rapidly changing health information (Qiu, Lunova, Greenfield, Kerr, Ergüven, Beaney, et al., 2025). This suggests a “generational gap” where older caregivers who may include grandparents in the nuclear and extended families identified in our study are more vulnerable to nutritional misinformation. Educational background may further compound this vulnerability, as largest proportion of parents (31.64%) had only a secondary education. Limited formal education is frequently associated with lower critical health literacy, which can prevent parents from effectively following complex nutritional advice. Furthermore, media literacy was identified as the weakest domain for both genders, with adequacy rates below 30% for women and 5% for men. In an era where 51.45% of our participants are general laborers or farmers who may rely heavily on social media for information, the combination of limited formal education and low media literacy creates a significant barrier. Deficits in critical appraisal are concerning, as parents may lack the necessary skills to distinguish between evidence-based advice and commercially of nutrition sources and mitigating the influence of unhealthy food marketing targeting school-aged children (Jindarattanaporn, Rittirong, Phulkerd, Thapsuwan, Thongcharoenchupong, 2023).

The Dual Burden and the Family Food Environments

This study identified a significant dual burden of malnutrition, with 30.9% of children deemed malnourished (14.01% underweight and 16.90% overweight/obese). The finding that boys had higher odds of poor nutritional status (AOR: 1.55) is noteworthy, possibly reflecting gender-specific dietary preferences or differences in physical activity levels (Grzymislawska, Puch, Zawada, Grzymislawski, 2020). Importantly, the high prevalence of parental obesity (40.10%) and overweight

(19.33%) underscores an “intergenerational cycle” of malnutrition. Previous research indicates that such aberrant parental BMI is often linked to a lower likelihood of high nutritional literacy (Wang, Wu, Shi, He, Hao, Wu, 2023; Zeng, Zhu, Cai, Xian, Li, Wang, et al., 2022). Since 59.43% of parents in this exhibit excess weight, it is likely that shared family dietary practices and sedentary modeling behaviors impact both caregivers and children. This suggestion that PNL interventions should not only focus on child outcomes but also address the nutritional status and literacy of the parents themselves to foster a healthy home food environment.

Limitations

Several limitations of this study are acknowledged. First, the cross-sectional design precludes causal inference. Second, the use of self-reported questionnaires may introduce information bias. Furthermore, the lack of data on parental dietary patterns, which may partially mediate these associations, should be noted. Future research utilizing longitudinal designs would be beneficial to confirm this predictive relationship.

Implication for Practice and Policy

1. Practice implications: (1) Health practitioners should focus on interactive sessions, such as role-playing for food-related communication, rather than passive information delivery. (2) Parents should be encouraged to involve children in food selection and meal preparation to enhance self-management skills.

2. Policy implications: (1) The Ministry of Public Health should integrate nutrition literacy assessments into routine child development check-ups. (2) School policies should restrict unhealthy food marketing within school zones to support children's critical media literacy.

Recommendation for Further Study

1. Future studies should utilize qualitative methods to explore the underlying barriers to applying nutrition knowledge in low-income families.

2. Longitudinal research is required to track whether early-childhood nutrition literacy predicts healthy weight maintenance into adolescence.

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