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Association of Maternal Nutrition Literacy with Feeding Practices and Nutritional Status among Preschool Children

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ABSTRACT

Maternal nutrition literacy may influence how mothers select, prepare, and provide food for young children, thereby shaping feeding practices and potentially contributing to children's nutritional status. This study was designed to examine the association of maternal nutrition literacy with feeding practices and nutritional status among preschool children. A cross-sectional analytical framework was developed for mother-child pairs with children aged 3-5 years. Maternal nutrition literacy was assessed across functional, interactive, and critical dimensions, while feeding practices included responsive feeding, restriction, pressure to eat, and monitoring. Child nutritional status was assessed using anthropometric indices based on World Health Organization growth standards. Because actual field data were not provided, the Results section of this manuscript uses an explicitly synthetic dataset of 240 mother-child pairs solely to demonstrate the proposed statistical analysis and manuscript structure. In the synthetic analysis, higher maternal nutrition literacy was associated with more responsive feeding practices and lower use of pressure-to-eat practices. Children of mothers with higher nutrition literacy also showed a more favorable distribution of anthropometric status; however, these numerical findings are illustrative and cannot be interpreted as empirical evidence. The proposed framework supports further field research using validated nutrition-literacy and feeding-practice instruments, standardized anthropometry, and multivariable analysis to clarify how maternal nutrition literacy relates to preschool feeding and nutritional status.

INTRODUCTION

Preschool age is a critical period for physical growth, cognitive development, and the establishment of dietary behaviors that may persist into later childhood and adulthood. During this period, children remain highly dependent on parents and caregivers for food availability, meal structure, portioning, and the social environment surrounding eating. Consequently, parental knowledge and skills related to nutrition can influence both the quality of foods offered and the manner in which children are encouraged to eat. Caregiver feeding practices are recognized as important influences on children's eating habits, dietary intake, and weight-related outcomes, although these

relationships may operate bidirectionally (Wang et al., 2022; Loth et al., 2022; Wang et al., 2024).

Nutrition literacy refers to an individual's capacity to obtain, understand, evaluate, and use nutrition information to make appropriate food-related decisions. For mothers of young children, this capacity may include understanding food groups and nutrient needs, interpreting nutrition information, selecting appropriate foods, planning balanced meals, and critically evaluating nutrition messages from health professionals, social media, product labels, and other sources. Parental nutrition literacy has been associated with child diet quality and is increasingly considered a relevant target for family-based nutrition education (Gibbs et al., 2016; O'Brien et al., 2024; Hashemzadeh et al., 2024). Recent evidence among mothers of preschool children also indicates that maternal nutrition literacy varies according to educational, socioeconomic, and information-related factors and is closely related to broader health literacy (Ahmadi & Karamitanha, 2023).

Maternal nutrition literacy is particularly relevant because feeding young children involves more than knowing which foods are nutritious. Mothers must translate knowledge into daily practices, including meal timing, food variety, portion decisions, responses to food refusal, encouragement of new foods, and the use or avoidance of pressure and restriction. Positive feeding approaches emphasize responsiveness to children's hunger and satiety cues, structured opportunities to eat, repeated exposure to nutritious foods, and avoidance of coercive feeding. Evidence from systematic reviews indicates that restrictive, pressuring, reward-based, and other non-responsive feeding practices can be associated with children's eating behavior and dietary intake (Say et al., 2023; Werner & Mallan, 2024; Wang et al., 2022). Parent-focused interventions can also modify selected feeding practices, although effects vary across domains and follow-up periods (Wang et al., 2024).

However, the relationship between maternal nutrition literacy and child nutritional status is not necessarily direct. A study of mothers with children aged five years and younger found that maternal nutrition literacy was associated with several socioeconomic and information-related characteristics, but children's body mass index did not differ according to maternal nutrition-literacy level (Aslan et al., 2023). Feeding practices and child weight may influence one another over time, and child temperament, parental stress, food insecurity, and household resources may further shape feeding interactions (Almaatani et al., 2023; Tauriello et al., 2023; Hashemzadeh et al., 2024). This suggests that nutritional status is produced by multiple interacting determinants rather than maternal literacy alone.

Recent intervention evidence further supports the importance of maternal knowledge, attitudes, and practices. A randomized trial using a mobile nutrition application among mothers of preschool-aged children with undernutrition reported improvements in maternal nutrition knowledge, feeding attitudes, and nutrition practices, accompanied by improvements in selected child anthropometric indicators. These findings suggest that maternal nutrition literacy may be modifiable and may contribute to child nutrition through behavioral pathways, although causal relationships require careful evaluation.

Despite increasing attention to food and nutrition literacy, evidence specifically integrating maternal nutrition literacy, feeding practices, and standardized nutritional-status indicators among preschool children remains limited. Recent reviews emphasize parental influence on preschool eating behavior, substantial heterogeneity in food-

literacy and feeding-practice measurement, and the need for longitudinal and theory-informed research (O'Brien et al., 2024; Wang et al., 2024). Studies of preschool feeding also show that caregiver practices occur in distinct patterns and can vary with family and child characteristics (Loth et al., 2021). Examining maternal nutrition literacy together with feeding practices may therefore provide a more comprehensive explanation of how maternal capabilities are translated into the child's feeding environment.

Accordingly, this study was designed to analyze the association of maternal nutrition literacy with feeding practices and nutritional status among preschool children. The proposed hypotheses were that higher maternal nutrition literacy would be associated with more responsive and less coercive feeding practices and with a more favorable nutritional-status profile after adjustment for relevant maternal, child, and household characteristics.

METHODOLOGY

Study Design and Setting

A cross-sectional analytical design was proposed for mother-child pairs with preschool children aged 3-5 years. The final empirical manuscript should specify the actual study location, recruitment period, and health or educational facilities used for participant recruitment. In the present manuscript-development version, no hospital, school, community health center, or geographic location is invented.

Study Population and Eligibility

Eligible participants would be biological mothers or primary maternal caregivers living with a preschool child aged 3-5 years and primarily responsible for the child's daily feeding. Mothers should be able to complete the study questionnaire and provide informed consent. Children with medical conditions that substantially affect growth, appetite, nutrient absorption, or prescribed dietary intake should be excluded or analyzed separately. Mother-child pairs with incomplete key exposure or anthropometric data should be excluded from the final analytical sample.

Sample Size and Synthetic Analytical Dataset

For manuscript demonstration, a synthetic dataset of 240 mother-child pairs was generated to illustrate the planned statistical approach. These records are not observations from actual participants and must not be reported as field data. An empirical study should determine its sample size using an a priori calculation based on the primary association, anticipated effect size, number of covariates, confidence level, and expected non-response.

Maternal Nutrition Literacy

Maternal nutrition literacy should be measured using a validated nutrition-literacy instrument appropriate to the language and cultural context of the study population. The instrument should assess the mother's ability to access, understand, interpret, and apply nutrition information. The Nutrition Literacy Assessment Instrument for Parents (NLit-P), for example, has demonstrated potential for assessing parental nutrition literacy and its relationship with child diet quality (Gibbs et al., 2016). Where supported by the selected instrument, scores may be evaluated continuously and categorized into low, moderate, and high nutrition-literacy groups. The final manuscript should report the instrument name, number of items, scoring system, validity, reliability, translation procedures, and cut-off values actually used.

Feeding Practices

Maternal feeding practices should be assessed using a validated parent-feeding questionnaire suitable for preschool-aged children. Domains should include responsive feeding or responsiveness to hunger and satiety cues, monitoring, restriction, pressure to eat, food as reward, and encouragement of dietary variety where applicable. Established tools include the Comprehensive Feeding Practices Questionnaire and the Feeding Practices and Structure Questionnaire family of measures, while newer instruments have been developed for specific non-nutritive feeding behaviors (Musher-Eizenman & Holub, 2007; Jansen et al., 2021; Savage et al., 2022). Domain scores should be calculated according to the original instrument instructions, and higher scores must be interpreted according to the direction specified by the instrument.

Child Anthropometry and Nutritional Status

Children's body weight and height should be measured using standardized procedures and calibrated equipment. Weight should be recorded with light clothing and without shoes, and standing height should be measured using a stadiometer. Age- and sex-standardized anthropometric indices should be calculated using World Health Organization growth standards. The final empirical study should report the exact indices used, such as BMI-for-age z-score (BAZ), height-for-age z-score (HAZ), and weight-for-age z-score (WAZ), together with the software or growth-reference procedure used to generate z-scores.

Covariates

Potential covariates should include maternal age, maternal education, employment, household socioeconomic indicators, number of children, child age and sex, recent child illness, household food security where available, and other variables supported by the conceptual framework. Covariate selection should be prespecified and should avoid indiscriminate adjustment for variables that may lie on the causal pathway.

Statistical Analysis

Descriptive statistics should be presented as mean and standard deviation or median and interquartile range for continuous variables and frequency and percentage for categorical variables. Differences across maternal nutrition-literacy categories may be examined using analysis of variance, Kruskal-Wallis tests, or chi-square tests as appropriate. Multivariable linear regression may be used for continuous feeding-practice and anthropometric z-scores, while logistic or multinomial regression may be used for categorical nutritional-status outcomes. Adjusted effect estimates, 95% confidence intervals, and two-sided p-values should be reported. Statistical significance should be defined at $p<0.05$.

Ethical Considerations

The synthetic analysis presented in this manuscript does not involve real human participants or identifiable human information. Therefore, its illustrative dataset does not require participant consent or institutional ethics approval. Before any empirical implementation involving mothers and children, approval must be obtained from the appropriate research ethics committee and written informed consent must be obtained from mothers or legal guardians. The actual committee name, approval number, and approval date must be inserted only when genuinely issued; no ethics information should be fabricated.

RESULTS AND DISCUSSION

Results

The synthetic sample included 240 mother-child pairs, with 80 observations in each

maternal nutrition-literacy category. The modeled sample was constructed so that major demographic characteristics were broadly distributed across literacy groups, while feeding-practice scores and child anthropometric outcomes showed plausible but non-deterministic differences.

Table 1. Illustrative characteristics of the synthetic mother-child sample according to maternal nutrition-literacy level.

Characteristic	Low literacy (n=80)	Moderate literacy (n=80)	High literacy (n=80)
Maternal age, years	29.4 ± 5.2	30.1 ± 5.0	30.8 ± 4.9
Child age, months	48.3 ± 8.0	48.7 ± 7.9	49.1 ± 7.8
Maternal nutrition-literacy score	46.8 ± 5.6	62.9 ± 4.7	79.4 ± 6.2
Responsive feeding score	3.12 ± 0.46	3.48 ± 0.43	3.83 ± 0.40
Pressure-to-eat score	3.31 ± 0.51	2.91 ± 0.49	2.52 ± 0.47
Dietary monitoring score	3.05 ± 0.48	3.42 ± 0.45	3.73 ± 0.43
BMI-for-age z-score	0.36 ± 1.19	0.22 ± 1.08	0.11 ± 1.01
Height-for-age z-score	-0.54 ± 1.05	-0.42 ± 1.01	-0.31 ± 0.97

In the synthetic analysis, higher maternal nutrition literacy was accompanied by higher responsive-feeding and dietary-monitoring scores and lower pressure-to-eat scores. These modeled differences were intentionally constructed as plausible analytical examples rather than observed effects.

Table 2. Illustrative adjusted associations in the synthetic dataset.

Outcome	Adjusted β per 10-point increase in literacy	95% CI	p-value
Responsive feeding score	+0.14	0.09 to 0.19	<0.001
Pressure-to-eat score	-0.16	-0.21 to -0.11	<0.001
Dietary monitoring score	+0.12	0.07 to 0.17	<0.001
BMI-for-age z-score	-0.08	-0.17 to 0.01	0.081
Height-for-age z-score	+0.07	-0.01 to 0.15	0.094

After adjustment for maternal age, education, employment, household socioeconomic indicators, and child age and sex in the illustrative model, each 10-point increase in maternal nutrition-literacy score was associated with a 0.14-point higher responsive-feeding score and a 0.12-point higher monitoring score, while pressure-to-eat scores were 0.16 points lower. The modeled associations with BMI-for-age and height-for-age z-scores were smaller and did not reach the conventional $p<0.05$ threshold, illustrating that maternal literacy may show a clearer relationship with feeding behavior than with anthropometric status in a cross-sectional analysis.

Discussion

The synthetic pattern illustrates a conceptually plausible pathway in which maternal nutrition literacy is more directly associated with feeding practices than with child anthropometric status. This distinction is important because nutrition literacy represents a maternal capability, whereas children's nutritional status is the product of multiple

biological, behavioral, socioeconomic, and environmental influences accumulated over time.

Evidence from mothers of preschool children supports the relevance of maternal nutrition literacy. Ahmadi and Karamitanha (2023) reported that health literacy and nutrition literacy were directly related and that maternal education, employment, and financial circumstances were among the factors differentiating mothers with adequate and inadequate literacy. These findings indicate that nutrition literacy should not be treated as an isolated individual characteristic; it is embedded within social and educational conditions.

The modeled positive association with responsive feeding is consistent with the broader food-literacy and feeding-intervention literature. Tartaglia et al. (2024) reported improvements in food-literacy behaviors and positive parenting feeding practices following a parent-focused program. A systematic review and meta-analysis by Wang et al. (2024) similarly found that caregiver interventions can reduce selected coercive feeding practices in the short term, although effects were not uniform across outcomes or follow-up periods. These findings support a behavioral pathway in which improved ability to understand and use nutrition information may translate into more constructive mealtime practices.

At the same time, higher maternal nutrition literacy should not automatically be assumed to produce normal child anthropometry. Aslan et al. (2023) examined nutrition literacy among mothers of children aged five years and younger and found that children's BMI was not affected by maternal nutrition-literacy level. Their results reinforce the possibility that literacy may influence proximal behaviors without necessarily producing a detectable cross-sectional difference in body size.

Recent intervention evidence provides additional context. A randomized controlled trial of the MyKid'sNutrition mobile application among mothers of children aged 2-6 years with undernutrition demonstrated significant improvements in maternal nutrition knowledge, feeding attitudes, and nutrition practices, together with improvements in selected anthropometric indicators. Such findings suggest that maternal nutrition capabilities are modifiable and may contribute to nutritional recovery, although intervention effects in children with undernutrition cannot be directly generalized to all preschool populations.

The association between nutrition literacy and feeding practices is likely to be bidirectional and context-dependent. Mothers with stronger literacy may be more capable of interpreting food labels, recognizing age-appropriate portions, evaluating online nutrition claims, and understanding the importance of dietary variety. These competencies may reduce reliance on coercive strategies such as pressure to eat. Conversely, children's food responsiveness, satiety responsiveness, temperament, and weight-related characteristics may also shape how parents feed them (Wang et al., 2022; Tauriello et al., 2023). Parental stress is another contextual factor associated with feeding styles and practices (Almaatani et al., 2023).

Responsive feeding is particularly relevant during the preschool period because appetite can vary substantially from meal to meal and children increasingly express food preferences and autonomy. A feeding environment that recognizes hunger and satiety cues may support self-regulation, whereas excessive pressure, restriction, or use of food for non-nutritive purposes may alter eating behavior. Systematic evidence indicates that different forms of restrictive feeding are not equivalent and may show different associations with child eating and dietary intake (Say et al., 2023; Werner & Mallan,

2024). The present synthetic model therefore treats responsive feeding, monitoring, pressure, and restriction as distinct constructs rather than combining them into a single undifferentiated parenting score.

Child nutritional status requires similarly nuanced interpretation. BMI-for-age reflects relative body mass but does not by itself distinguish dietary quality, body composition, or micronutrient status. Height-for-age reflects accumulated linear growth and may be influenced by earlier-life nutrition, infection, maternal characteristics, and socioeconomic conditions. Therefore, a current maternal nutrition-literacy score may have a relatively modest cross-sectional association with anthropometric indices even when it is meaningfully associated with present-day feeding behavior.

Recent reviews of food literacy and feeding among young children emphasize the importance of parental influence while also identifying substantial heterogeneity in measurement approaches and intervention design (O'Brien et al., 2024; Wang et al., 2024). Real-time assessment research further suggests that feeding practices vary across eating occasions and may not be fully captured by global retrospective questionnaires (Loth et al., 2022). This methodological diversity limits direct comparison between studies and highlights the need to use validated instruments with clearly reported domains and scoring procedures.

For an empirical implementation, the study should therefore distinguish the hypothesized pathway from the statistical model. Maternal nutrition literacy may influence feeding practices, which in turn may influence dietary intake and eventually nutritional status. If feeding practices are treated as mediators, indiscriminately adjusting for them in a model estimating the total association between maternal literacy and nutritional status could obscure part of the pathway. A sufficiently powered field study could test direct and indirect relationships using mediation analysis or structural equation modeling.

Several limitations should be anticipated. Cross-sectional data cannot establish temporality, and self-reported literacy and feeding practices are vulnerable to social-desirability and recall biases. Longitudinal evidence indicates that parent feeding and child eating behaviors can influence one another, complicating causal interpretation (Wang et al., 2022). Anthropometric status may also be affected by unmeasured variables such as food insecurity, morbidity, birth history, dietary intake, childcare arrangements, household resources, parental stress, and child temperament (Almaatani et al., 2023; Tauriello et al., 2023; Hashemzadeh et al., 2024). The final study should therefore prespecify a conceptual framework and collect major confounders rather than selecting covariates solely according to statistical significance.

Most importantly, the numerical findings in this manuscript are synthetic. They demonstrate how the tables, regression analyses, and interpretation could be structured but do not provide evidence about actual mothers or preschool children. Actual field data may show stronger, weaker, null, or differently directed associations. The manuscript should only be converted into an empirical original-research report after genuine participant data and the corresponding ethics documentation are available.

CONCLUSION

This manuscript proposes a framework for examining maternal nutrition literacy, feeding practices, and nutritional status among preschool children. In the synthetic analytical demonstration, higher maternal nutrition literacy was associated more clearly with responsive feeding, monitoring, and lower pressure to eat than with

anthropometric z-scores. These illustrative findings should not be interpreted as empirical evidence. Field research using validated literacy and feeding instruments, standardized child anthropometry, appropriate confounder adjustment, and prospective follow-up is needed to determine whether maternal nutrition literacy contributes to healthier feeding environments and improved nutritional outcomes in preschool children.

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