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Investigating the correlations between nutrition literacy of mothers and offspring physical growth and development, dietary diversity and quality, and vitamin levels

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ABSTRACT

OBJECTIVE: To investigate the relationship between nutrition literacy (NL) of mothers and physical growth and development, dietary diversity and quality, and vitamin levels of their children aged 24-59 months.

METHODS: A cross-sectional survey-based study was conducted at well-child outpatient clinic. Eighty-eight mother-child pairs included. Mother's Evaluation Instrument of Nutrition Literacy for Adults (EINLA) scores and child anthropometric z-scores, age when reaching six gross motor milestones, dietary diversity and the Mediterranean Diet Quality Index scores, and serum vitamin A, B1, B2, B12, C, D, and E levels were measured. Two independent groups comparison statistics and Spearman rank correlations were performed.

RESULTS: Thirty-four mothers (38.6%) had borderline and 54 mothers (61.4%) had adequate NL level. The percentages of wasted and acutely malnourished children were higher in the borderline NL group (17.6% vs. 1.9%, p=0.005 and 14.7% vs. 1.9%, p=0.030, respectively). There was no significant correlation between maternal EINLA score and child motor skill acquisition, dietary diversity, or serum vitamin status (p>0.05). There was a correlation between maternal EINLA score and child dietary quality score (r=0.218, p=0.041).

CONCLUSION: Increasing NL of mothers may be a step toward improving the dietary quality of children and reducing the burden of child undernutrition.

Keywords: Child diet; child physical growth and development; mother; nutrition literacy.

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Nutrition literacy (NL) is considered a form of "health literacy" that applies to nutrition. The definition of NL is as follows: the degree to which people have the ability to obtain, process and understand basic diet information and the tools needed to make appropriate nutrition decisions [1, 2]. NL encompasses an individual's dietary pattern and was shown to influence healthy-eating behaviours. NL level of individuals relates not only to their own health but also to the health of future generations and community health. Adequate NL

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of parents may have positive consequences for healthy eating in households. The nutrition literacy of mothers (NLM) especially plays an essential role for developing good eating attitudes, behaviours and habits in their children, and this will help promote healthy lifestyles [2–4].

Young children maintain growth and development by obtaining macro- and micronutrients through consumed foods on a daily basis. Therefore, a child's diet that meets optimal dietary quality and diversity standards is essential to preventing micronutrient deficiencies and malnutrition [5]. Several studies from different countries with different levels of development showed that NLM is particularly influential for nutrition and nutrition outcomes (malnutrition, including undernutrition (wasting or stunting), inadequate vitamins or minerals, being overweight and obese) of children. These previous studies emphasised that higher levels of NLM have a significant, positive association with healthy diet and healthy growth of the child [6–11]. A healthy diet provides good nutrition and a good nutritional status ensures a healthy and strong body able to carry out activities that support good motor skill development in early childhood [12]. Also, social factors influence motor skill development among young children and developmental delay in motor function of young children may be a sign of psychosocial conditions [13, 14]. Given these conclusions, level of NLM may have a significant relationship with child gross motor development. To the best of our knowledge, there is no study investigating these relationships in Turkish mother-child pairs. Only one previous single-centre study found that Turkish mothers of children aged 3–6 years had mean NL score indicating adequate NL level and determined certain sociodemographic variables which were significantly different according to NL total scores [15]. Different from previous studies, the intention in our study is to use an integrated approach to NLM and young child health by investigating child physical growth, nutritional status, and development together. The aim of this study was to investigate the relationship between NLM with physical growth and motor development, dietary diversity and quality, and vitamin levels in children under 5 years of age in Turkiye.

Highlight key points

- Nutrition literacy level of mother significantly correlates with child dietary quality.
- Acute malnutrition including wasting is more common in children whose mothers have borderline nutrition literacy than children whose mothers have adequate nutrition literacy.
- Mother's nutrition literacy does not relate to child motor skill acquisition, dietary diversity, or serum vitamin status.
- Increasing nutrition literacy of mothers may provide improvement in the dietary quality of children and reduction in child undernutrition.

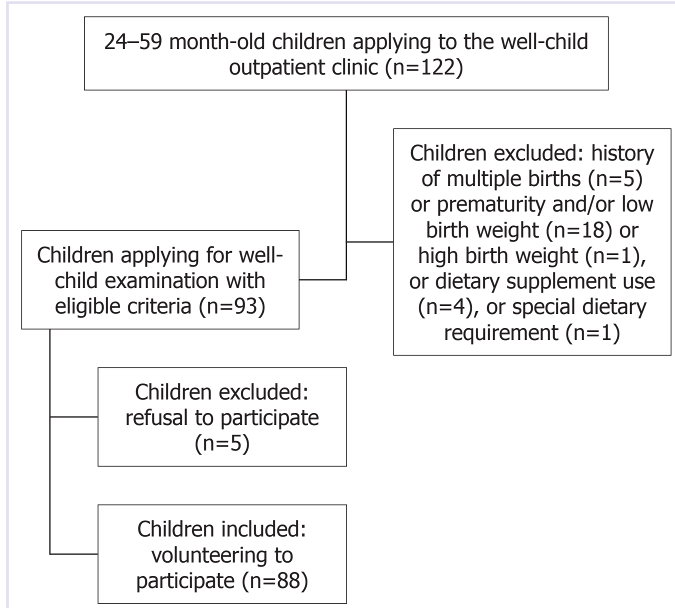

Figure 1. Flowchart for study population selection.

MATERIALS AND METHODS

Study Design and Participants

This cross-sectional survey-based study was carried out at University Hospital of Mersin. Healthy children and their literate healthy mothers constituted the study subject group. Children aged 24 to 59 months who were admitted to the well-child outpatient clinic were included. The exclusion criteria were multiple births, prematurity or postmaturity (<38 or >42 weeks of gestational age), low or high birth weight (<2500 or >4000 g), dietary supplement use, and special dietary requirements (Fig. 1). Written informed consent was obtained from the mothers. This study was performed in accordance with the Declaration of Helsinki and the Mersin University Clinical Research Ethics Committee approved this study (15 December 2021/768).

Data Collection

Face-to-face interviews were conducted with mothers between January 1 and June 1, 2022, at the hospital during well-child visits. A structured questionnaire was designed to collect data and sociodemographic, early life nutrition, and gross motor development characteristics were queried.

Sociodemographic variables included child and family characteristics such as child age, gender, delivery method, birth weight and birth order, and primary caretaker, and parental ages and educational levels, number of children in the family, monthly household income, family structure and place of residence. Maternal occupation and smoking were also ascertained.

Early life nutrition characteristics included breastfeeding and complementary feeding practices: when breastfeeding started and complementary foods were introduced, feeding type within the first six months, and total duration of breastfeeding.

Child gross motor assessment included six motor milestones reported by the World Health Organization (WHO): sitting without support, standing with assistance, crawling on hands and knees, walking with assistance, standing alone and walking alone. Based on the WHO references, the 90th percentiles for the achievement of each motor milestone are 7.6, 9.6, 10.7, 11.2, 13.6 and 14.6 months, respectively [16]. Mothers were asked the ages at which their children reached these motor milestones. Suspected developmental delay was considered if the child reached each milestone at an age above the 90th percentile [16].

Child dietary assessment included dietary diversity and diet quality. Dietary diversity was assessed using the 24-hour dietary recall method. Mothers were asked to recall all the food and drink items consumed by their children in the previous 24 hours. The 24-hour recall was carried out in chronological order (morning to night) as standard, and a list of foods was made. Following WHO categorisation, the recalled foods were categorised into seven food groups (grains, roots, and tubers; dairy products; vitamin A rich fruits and vegetables; other fruits and vegetables; eggs; flesh foods; legumes and nuts) and the total number of different food groups consumed was calculated (range 0–7). Dietary diversity was defined as appropriate (≥4 food groups/day) and inappropriate (≤3 food groups/day) [17]. Diet quality was identified using the Mediterranean Diet Quality Index (KIDMED). KIDMED is a parent-reported measure of diet quality in children and adolescents. KIDMED uses 16 items to evaluate adherence to the Mediterranean diet. Four items are given a value of -1 for lower adherence, while 12 items are given a value of +1 for higher adherence. The total score (range 0–12) is calculated by adding the scores for the items. If the total score is ≥8 it indicates good diet quality, if it is between 4–7 it indicates average quality which needs to be improved, and if it is ≤3 it indicates poor diet quality [18].

Assessment of Nutrition Literacy of Mothers

Nutrition literacy status of mothers was determined using the Evaluation Instrument of Nutrition Literacy for Adults (EINLA). EINLA has 35 items and five sections. The first section covers general nutritional information, the second section includes reading comprehension and interpretation, the third section covers food groups, the fourth section covers the serving sizes, and the fifth section covers how to read food labels and the ability to do simple calculations. While each correct answer receives one point, unanswered or incorrect answers receive zero points. A total score between 0 and 11 is considered inadequate, between 12 and 23 is considered borderline, and between 24 and 35 is considered adequate when NL level is graded [1].

Anthropometric Measurements

Weight, height, upper arm circumference, and triceps skinfold thickness measurements were collected. The child growth standards of the WHO were utilised for the calculation of anthropometric z-scores. Weight-for-age, height-for-age and weight-for-height z-scores were categorised into <-2 standard deviations (SD), (-2)-(+2) SD, and > +2 SD groups. Z-scores not falling between -2 and +2 SD and upper arm circumference values less than 12.5 cm were accepted as child malnutrition. Weight-for-age <-2 SD was defined as underweight, height-for-age <-2 SD was defined as stunting, weight-for-height <-2 SD was defined as wasting, and upper arm circumference <12.5 cm was defined as acute malnutrition [19–21].

Also, weight and height of mothers were measured and body mass index (BMI) values were calculated (kg/m^2). The same physician (S.M.) performed anthropometric measurements by standard techniques using calibrated equipment and repeated the measurement two times.

Evaluation of Serum Vitamin Levels

Child blood samples were taken, serum was separated and stored at -80 C until analysis. Vitamin A (retinol), vitamin B1, vitamin B2, vitamin B12, vitamin C, vitamin D, and vitamin E (alpha-tocopherol) levels were analysed with ELISA method with a Thermo fisher Multiskan™ GO ELISA Reader using ELK Biotechnology ELISA kits. The obtained results were evaluated in accordance with the suggested normal vitamin levels found in the literature. Concentration of <20 mcg/dL was defined as vitamin A deficiency, <5 mcg/mL as vitamin E deficiency, <3 mcg/dL as vitamin B1 deficiency, <4 mcg/dL as vitamin B2 deficiency, <200 pg/mL as vitamin B12 deficiency, <0.2 mg/dL as vitamin C deficiency, <12 ng/mL as vitamin D deficiency, and 12–29 ng/mL as vitamin D insufficiency [22–27].

Sample Size Calculation and Statistical Analyses

Because the relationship between NLM and child anthropometric or dietary indices is not known in the Turkish population, a moderate to high correlation was assumed [9] and the sample size was determined to be 88 mother-child pairs with an effect size of 0.36 and a power of 95% using the "G*Power" program.

The SPSS software program (version 21.0. Armonk, New York: IBM Corp.) was used for statistical analysis. The data were examined for normality with histograms and the Kolmogorov-Smirnov test. Median (IQR, 25th–75th percentile), mean±SD, and percentage values were stated. Groups determined according to the level of NLM were compared. The Student's t-test was used to compare two parametric values, and the Mann-Whitney U test was used to compare two nonparametric values. The categorical variables were tested with the chi-square test. Spearman rank correlation was used to measure the relationship between NLM scores and child anthropometric, motor development, dietary parameters, and vitamin levels. All statistical tests were two-sided and $p<0.05$ was considered statistically significant.

RESULTS

General Characteristics

The sample consisted of 88 mother-child pairs. The median age of children was 42 (34.5–50.5) months and 56.8% were male. The median age of mothers was 31 (28–35.5) years. The median (min–max) total score the mothers obtained from EINLA was 25 (19–32). Thirty-four mothers (38.6%) had borderline NL level and 54 mothers (61.4%) had adequate NL level. There was no mother with inadequate NL level.

When sociodemographic characteristics were compared between the borderline and adequate NL groups, no statistical difference was found, except for child birth order, paternal educational level, and number of children in the family. Being the 1st child for the index child was significantly more common in the group of mothers with adequate NL. The frequency of fathers with high school/collage degree was significantly higher in the adequate NL group. While the median (min–max) number of children in the family was significantly lower in the group of mothers with adequate NL (Table 1).

No correlations were found between the maternal EINLA score and the child age, maternal age, maternal education level and monthly income ($p>0.05$). The maternal EINLA score was negatively weakly correlated with child birth order and number of children in the family, and it was positively weakly correlated with paternal education level (rho=-0.213, p=0.046; r =-0.296, p=0.005 and rho=0.266, p=0.012, respectively).

Breastfeeding and complementary feeding practices were not statistically different between the borderline and adequate NL groups ($p>0.05$) (Table 1). There was no correlation between the total duration of breastfeeding and the maternal EINLA score (rho=0.022, p=0.839).

Anthropometric and Motor Development Characteristics

Means for child anthropometric z-scores were not statistically different between the borderline and adequate NL groups ($p>0.05$). Also, medians for child upper arm circumference and triceps skinfold thickness were not different between the two groups ($p>0.05$). The percentages of children who had low weight-for-height (wasted) and who had low upper arm circumference (acutely malnourished) were significantly higher in the borderline NL group (p=0.005 and p=0.030, respectively) (Table 2). No correlations were found between the maternal EINLA score and the child's weight-for-age, height-for-age and weight-for-height z-scores, upper arm circumference, or triceps skinfold thickness (r=-0.012, p=0.911; r=-0.035, p=0.743; r=0.023, p=0.832; r=0.144, p=0.182 and r=0.088, p=0.417, respectively).

Mean BMI values of mothers did not differ between the borderline and adequate NL groups (p=0.775) (Table 2). There was no correlation between the maternal EINLA score and body mass index values (r=-0.119, p=0.270).

Median ages when the child achieved the six gross motor skills did not differ between the borderline and adequate NL groups ($p>0.05$). Also, frequency of suspected developmental delay for each gross motor milestone was not statistically different between the two groups ($p>0.05$) (Table 2). No correlation was found between the maternal EINLA score and the number of gross motor skills with suspected developmental delay (r=-0.004, p=0.973). Also, there was no correlation between the ages for motor skill acquisition and maternal EINLA scores ($p>0.05$).

TABLE 1. Comparison of sociodemographic and child early nutrition characteristics based on level of nutrition literacy of mothers

	Borderline nutrition literacy (n=34)	Adequate nutrition literacy (n=54)	p
Age, month	45 (36 - 52)	40 (34 - 48)	0.263
Gender, male (%)	58.8	55.6	0.763
Gestational age, week	39 (38 - 39)	38 (38 - 39)	0.122
Birth weight, gram	3196±390	3284±397	0.311
Delivery, caesarean (%)	47.1	64.8	0.100
Birth order (%)			**0.029**
1st	35.3	59.3	
≥2nd	64.7	40.7	
Primary caretaker (%)			0.519
Mother	91.2	85.2	
Grandmother, baby-sitter or kindergarten	8.8	14.8	
Initiation of breastfeeding (%)			0.918
Within 1 hour	82.4	81.5	
Between 1 and 24 hours	17.6	18.5	
Feeding type within 6 months (%)			0.256
Exclusive breastfeeding	64.7	75.9	
Breastfeeding and infant formula	35.3	24.1	
Duration of breastfeeding, months	12 (10–18)	12 (10–18)	0.624
≤12 months (%)	64.7	55.6	
13–18 months (%)	23.5	25.9	0.624
>18 months (%)	11.8	18.5	
Initiation of complementary feeding (%)			0.377
At ≥4–<6 months of age	26.5	18.5	
At 6 months of age	73.5	81.5	
Maternal age, year	30 (29–37)	31 (27–34)	0.422
Paternal age, year	36.5 (32–42)	34.5 (30–40)	0.347
Maternal educational level (%)			0.266
Primary school	41.2	29.6	
High school/collage	58.8	70.4	
Paternal educational level (%)			**0.030**
Primary school	44.1	22.2	
High school/collage	55.9	77.8	
Maternal occupation (%)			0.118
Working mom	5.9	18.5	
Stay-at-home mom	94.1	81.5	
Maternal smoking (%)	32.4	25.9	0.515
Maternal smoking during pregnancy and/or lactation (%)	8.8	9.3	1.00
Number of children in the family	2 (2–2)	2 (1–2)	**0.003**
Monthly income, US$	485 (400–550)	470 (400–550)	0.654
Family structure, nuclear (%)	91.2	94.4	0.673
Settlement, urban/semi-urban (%)	100.0	100.0	–

Results are expressed as mean±SD, median (25th-75th percentile) and percentage.

Table 2. Comparison of child gross motor development and anthropometric characteristics based on level of nutrition literacy of mothers

	Borderline nutrition literacy (n=34)	Adequate nutrition literacy (n=54)	p
Suspected delay (%)			
Sitting without support	2.9	9.3	0.399
Standing with assistance	23.5	14.8	0.302
Crawling on hands and knees	0	0	–
Walking with assistance	26.5	38.9	0.231
Standing alone	8.8	5.6	0.673
Walking alone	2.9	7.4	0.645
Suspected developmental delay for at least one motor skill (%)	50	51.9	0.866
Z-scores			
Weight for age	-0.09±1.31	-0.13±0.86	0.867
Height for age	0.42±1.16	0.14±1.10	0.265
Weight for height	-0.55±1.62	-0.32±1.06	0.436
Weight for age (%)			0.787
(-2) – (+2) SD	94.1	98.1	
<-2 SD	5.9	1.9	
Height for age (%)			0.280
(-2) – (+2) SD	100.0	98.1	
<-2 SD	0	1.9	
Weight for height (%)			**0.005**
(-2) – (+2) SD	82.4	98.1	
<-2 SD	17.6	1.9	
Upper-arm circumference, cm	13 (12–14)	13 (12.5–14)	0.376
<12.5 cm (%)	14.7	1.9	**0.030**
Triceps skinfold thickness, mm	9.5 (9–11)	10 (9–11)	0.579
Maternal body mass index, kg/m^2	24.3±3.1	24.0±3.6	0.775
Underweight (<18.5) (%)	0	5.6	
Healthy weight (18.5–24.9) (%)	58.9	59.3	0.623
Overweight (25.0–29.9) (%)	38.2	31.4	
Obese (≥30) (%)	2.9	3.7	

SD: Standard deviation. Results are expressed as mean±SD, median (25th–75th percentile) and percentage.

Feeding and Dietary Characteristics

Overall the most frequently consumed food group was grains, roots, and tubers. This high frequency was due to the consumption of bread, with 87 children (98.9%) consuming bread in the previous 24 hours. Median number of food groups consumed by children in the previous 24 hours did not differ between the borderline and adequate NL groups (p=0.799). Also, frequency of child inappropriate diet diversity did not differ between the borderline and adequate NL groups (p=0.367) (Table 3). No correlation was found between the maternal EINLA score and child dietary diversity score (r=0.034, p=0.754).

Median KIDMED score was 5 (4–6) in the group of mothers with adequate NL and it was 5 (4–5) in the group of mothers with borderline NL (p=0.048). The percentages of children with good, average and poor diet quality were not statistically different between the borderline and adequate NL groups (p=0.224) (Table 3). There was a weak correlation between the maternal EINLA score and child KIDMED score (r=0.218, p=0.041).

TABLE 3. Comparison of dietary characteristics and vitamin levels based on level of nutrition literacy of mothers

	Borderline nutrition literacy (n=34)	Adequate nutrition literacy (n=54)	p
Food groups consumed in the previous 24 hours (%)			
Grains, roots, and tubers	100.0	98.1	1.00
Dairy products	85.3	81.5	0.643
Other fruits and vegetables	82.4	81.5	0.918
Eggs (%)	76.5	68.5	0.421
Flesh foods (%)	35.3	37.0	0.869
Legumes and nuts (%)	17.6	33.3	0.108
Vitamin A rich fruits and vegetables (%)	8.8	5.6	0.673
Number of food groups consumed in the previous 24 hours	4 (4–5)	4 (3–5)	0.799
Dietary diversity (%)			0.367
Inappropriate	17.6	25.9	
Appropriate	82.4	74.1	
KIDMED score	5 (4–5)	5 (4–6)	**0.048**
Diet quality (%)			0.224
Good	2.9	9.3	
Average	79.4	83.3	
Poor	17.7	7.4	
Vitamin A (mcg/dl)	46.6 (36.8–59.3)	55.0 (38.6–62.1)	0.177
Retinol deficiency (%)	17.6	14.8	0.724
Vitamin B1 (mcg/dl)	12.4 (2.2–25.4)	13.4 (2.5–25.6)	0.973
Vit B1 deficiency (%)	29.4	27.8	0.869
Vitamin B2 (mcg/dl)	28.8 (24.2–35.4)	27.8 (22.5–39.2)	0.725
Vit B2 deficiency (%)	0	7.4	0.156
Vitamin B12 (pg/ml)	636 (605–699)	595 (430–672)	0.073
Vit B12 deficiency (%)	11.8	13.0	1.00
Vitamin C (mg/dl)	3.1 (0.9–3.9)	3.3 (1.3–4.5)	0.512
Vit C deficiency (%)	17.6	14.8	0.724
Vitamin D (ng/ml)	48.5 (34.4–53.6)	46.9 (11.3–53.8)	0.870
Vit D insufficiency or deficiency (%)	23.5	27.8	0.659
Vitamin E (mcg/ml)	7.7±2.9	7.4±2.9	0.588
Vit E deficiency (%)	11.8	20.4	0.296
At least one vitamin deficiency (%)	73.5	74.1	0.955
Vitamin deficiency (%)			0.892
None	26.5	25.9	
1 deficient vitamin	44.1	37.0	
2 deficient vitamins	20.6	25.9	
3 or 4 deficient vitamins	8.8	11.2	

KIDMED: Turkish version of the Mediterranean Diet Quality Index. Results are expressed as mean±SD, median (25^{th}-75^{th} percentile) and percentage.

Serum Vitamin Levels

Median serum concentrations of vitamin A, vitamin B1, vitamin B2, vitamin B12, vitamin C, and vitamin D and mean serum concentration of vitamin E were not statistically different between the borderline and adequate NL groups (p>0.05) (Table 3). No correlation was found between the maternal EINLA score and the child's serum vitamin levels ($p>0.05$). Also, the maternal EINLA score did not correlate with the number of deficient vitamins (rho=0.085, p=0.431).

DISCUSSION

The present study was conducted to investigate the correlations between level of NLM and child physical growth, gross motor development, dietary diversity and quality, and vitamin levels in pairs of Turkish mothers and children under five years of age. The findings indicate that higher level of NLM is significantly positively correlated with child dietary quality and acute malnutrition including wasting is more common in children whose mothers have borderline NL than children whose mothers have adequate NL.

An optimal diet quality is essential for child health because it is crucial for young children to grow and develop optimally [28]. Gibbs et al. [8] reported a significant relationship between NL of parents and diet quality of children aged 4 to 6 years, and concluded that increasing the NL level of parents provided an increase in child Healthy Eating Index scores. Consistent with this, a significant positive correlation was demonstrated between NLM and child KIDMED score in our study. Hence, NLM seems to be a significant predictor of child diet quality.

NL was evaluated to be very weak in mothers of malnourished children under five years of age in Afghanistan [6]. Consistently, the mean EINLA score among Iranian mothers of malnourished children was lower than for Iranian mothers with normal nourished children [11]. Nutrition-knowledge of mothers was positively associated with child height-for-age and weight-for-height z-scores in Nigeria [9]. In this study, we found that acute malnutrition including wasting is more common in children whose mothers have borderline NL than children whose mothers have adequate NL. Thus, national programs fighting child undernutrition should include NLM interventions. NLM interventions previously had an effect in preventing stunting in children aged 0–6 months in Indonesia [7].

Maternal determinants of acute malnutrition among under-five children have been revealed in several reports. The mother's age at birth, formal education, marital status, and the interval between births were found to be significant predictors of acute malnutrition in children under five years of age [29, 30]. From our findings, it is concluded that the mother's NL level may also be related to acute malnutrition in children under five.

Neurodevelopment is significantly influenced by nutrition during the late foetal and early postnatal periods. It was concluded that optimising nutrition during the foetal and early childhood periods was an excellent opportunity to impact neurodevelopment and brain function [2]. We assessed gross motor development using WHO's simple tool to identify children with delays in six motor milestones of achievement to compare the sequence of achieving the milestones in children from various backgrounds [16]. Although no relationship was found between gross motor development and NLM, we suggest that prospective studies should assess the development of children in all neurodevelopmental areas from birth by considering level of NLM.

High NL prevents poor dietary diversity by ensuring healthy food choices. Higher NLM relates to higher scores for dietary diversity and lower rates of child malnutrition [3, 31]. The present study did not find any correlation between NLM and child dietary diversity. Higher NL improves parental feeding practices and improved parental feeding practices foster a varied diet for children [32]. Also, healthy eating literacy of mothers is associated with healthy meal provision for family members [33]. Further studies taking into account parental feeding practices and meal provision are necessary in order to confirm a relationship between level of NLM and child diet diversity in Turkiye.

Micronutrient deficiencies in early childhood may lead to impaired growth and poor neuromotor development. Micronutrient malnutrition is widespread among children under five in low- and middle-income countries and concurrent deficiencies are also common [34]. The present study also revealed that three out of every four children had deficiency of at least one of the seven vitamins and NLM level was not correlated with vitamin levels or number of deficient vitamins. A lower maternal nutrition knowledge leads to inadequate child diet and an inadequate diet in children causes micronutrient deficiencies [10, 34]. Therefore, studies with larger samples sizes should be performed to check our finding.

Previously, positive relationships were reported between NL of parents with income, parental age and parental education [8]. Consistently, occupation, monthly income and spouse education level were significantly different based on total EINLA scores among Turkish mothers with preschool children [12]. The present study contributes to the existing literature by presenting a negative correlation between NLM and number of children in the family. This finding may indicate a positive relationship between NL and family planning literacy.

A previous study from Turkiye reported a significant positive correlation between health literacy level of mothers and postpartum breastfeeding self-efficacy level [35]. In our study, no relationship was found between breastfeeding practices and NLM.

Parent BMI was significantly related to parent NL in the United States [8]. Indonesian households with double burden of malnutrition (stunted child under five and overweight/obese mother) had significantly lower NLM compared to those without double burden of malnutrition [3]. The present study did not find any correlation between mother's NL level and BMI. This may be due to the fact that the mother's own diet, physical activity and NL level were not considered together. In addition, mother's NL level did not correlate with child anthropometric z-scores, in our study. Consistently, Aslan et al. [36] reported that the BMI of the under-five children was not affected by the NL level of their mothers in Turkiye.

One limitation is that this was a single-centre study with a cross-sectional design, so the power in terms of national representativeness may be low. Further studies should include a diverse range of populations to ensure that our results are generalizable. Another limitation of the study is the lack of a group of mothers with inadequate NL. There may have been bias in remembering child motor development by age. ELISA is not considered the gold standard assay method for the detection of serum vitamin levels and serum vitamin levels may not be a sensitive indicator of vitamin stores [33]. Lastly, since the nutrition literacy groups differed in terms of some sociodemographic variables, the regressions should control for any sociodemographic variables correlated with the KIDMED scores further.

Conclusion

Our findings suggest that NLM can play role in child dietary quality and child nutrition outcomes. Thus, NLM promotion can improve diet quality and reduce wasting among young children. Further studies from Turkiye should include mothers with inadequate NL to assess nutritional health status of their young children and community-based case-control studies should assess the association between NLM and acute malnutrition in young children. Also, studies with larger sample sizes may recheck correlations between NLM, child dietary diversity and micronutrient deficiencies.

Ethics Committee Approval: The Mersin University Clinical Research Ethics Committee granted approval for this study (date: 15.12.2021, number: 768).

Authorship Contributions: Concept – SM, OT, GT; Design – SM, OT, GT; Supervision – OT; Fundings – SM, OT; Data collection and/or processing – SM, OT; Analysis and/or interpretation – SM, OT, GT; Literature review – SM, OT, GT; Writing – SM, OT; Critical review – OT, GT.

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