



Original Article

Maternal Nutritional Knowledge and Nutritional Outcome of Children: A Cross-sectional Study from a Developing Country

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ABSTRACT

Objectives: Malnutrition is a state in which a deficiency or excess of nutrients causes adverse effects on the body. Any diet that does not supply a healthy amount of nutrients, such as carbohydrates, fats, proteins, and lipids, can cause malnutrition. Malnutrition accounts for half of all childhood deaths worldwide. Pakistan has the second highest infant and child mortality rate in South Asia. Mothers play an important role in providing food and looking after their children; thus, their knowledge has significant importance in their child's nutritional status and growth outcome.

Material and Methods: Maternal nutritional knowledge was assessed using a structured questionnaire, which was divided into multiple sections covering the demographic data, knowledge about various food ingredients, dietary recommendations, and consequences of not following them. Children's height was measured and plotted on the World Health Organization growth charts for girls and boys under 5 years and the height was measured using Z scores. Data were then analyzed using the Statistical Package for the Social Sciences 23. Chi-square was applied, and a regression analysis was performed.

Results: According to the study, the child's height has a significant association with maternal education (0.008), the mother's employment (0.04) status, and the area where the child belongs (0.02). Thirty-eight per cent of children have height falling in 3 standard deviation (SD), indicating good height for age. The knowledge score among the mother of the child with good height, that is, 2SD, which is relatively higher than the mother of a child with severe stunting, that is, >-2SD for all the categories of food ingredients, dietary recommendations, and consequences of not following them, Children of educated mothers have good height and physical health. However, the child's height is not much influenced by specific maternal knowledge of food ingredients, their dietary importance, and daily recommendations.

Conclusion: Child growth depends on their mothers' education, employment, and area of residence but not on their specific knowledge about food. This can highlight the importance of other factors such as genetics, ethnicity, hormonal, metabolism, medical conditions, and environmental factors, in determining a child's overall height and nutritional status.

Keywords: Maternal knowledge, Child nutrition, Malnutrition, Stunting

INTRODUCTION

Malnutrition is defined as a state of nutrition in which an imbalance of nutrients and energy that have definite adverse effects on body structure and function and alters clinical outcomes.

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A diet that is deficient in micro- or macronutrients such as proteins, carbohydrates, fats, minerals, and vitamins causes malnutrition.^[1] In children under five years, malnutrition is assessed by various parameters such as muscle wasting, being underweight for height, and stunting, and being short height for age.^[2] Stunting is defined as height for age z score (HAZ) < -2 Standard deviation (SD). HAZ is estimated by subtracting the sex and age median value from the standard population and dividing it by the SD of the standard population.^[3] Wasting is a state of acute malnutrition; this short period of low nutrition leads to low weight for height. Stunting and wasting are perfect guides for considering a child's overall well-being and chronic malnutrition.^[4] According to the World Health Organization's (WHO) Growth Standard Median, about 161 million children are stunted with HAZ < -2 SD. In the world, around 165 million children under five years are malnourished.^[5] Globally, malnutrition is one of the leading causes of early childhood deaths. Among children under five years, the prevalence of stunting is 30% (170 million), and that of being underweight is 19% (110 million) worldwide.^[6]

In South Asia and the developing world, Pakistan is ranked second highest in infant and child mortality rate. According to data from the National Nutritional Survey 2018, four out of ten children under the age of five years in Pakistan are stunted, and 17.7% suffer from stunting and malnutrition. The percentage of waste increased from 8.6% in 1997 to 15.1% in 2018.^[7]

Nutritional knowledge includes information about health and nutrition, knowledge of diet and disease, concepts of dietary guidelines, major nutrient sources, and nutritional recommendations.^[8] Maternal nutritional knowledge has an overall positive impact on a child's nutritional health.^[9]

Mothers are in charge of dietary choices and food preparation; thus, their food selection priorities significantly impact the health outcomes of their children and household members. Multiple factors play a role in nutritional health, such as choice of quality, quantity, and versatility of ingredient selection and food preparation. Sanitary practices observed by the person who prepares the food are also crucial.^[10]

Long-term nutritional outcomes are estimated from the child's HAZ. The nutritional status of the child, in the long run, is considered to be influenced by maternal nutrition knowledge.^[11,12]

In Pakistan malnutrition is prevalent in all its forms. The daily diet includes more processed foods than the traditional diet, which is leading to obesity and children being overweight. Despite this malnutrition, stunting is high among children.^[13] Thus, nutritional knowledge significantly affects dietary choices. It has a pivotal role in children's nutritional status and ultimately helps in making better food choices and improving nutrition guidelines. This study is

designed to determine maternal nutritional knowledge and her child's nutritional outcomes.

MATERIAL AND METHODS

Study design

This was a cross-sectional survey quantitative study based on administering a pretested standardized questionnaire to assess maternal nutrition knowledge and child nutritional outcomes.

Study protocol

The data were gathered via "Google Forms," a survey administration application. The questionnaire was voluntary, and the responses were recorded after informed consent was obtained.

The study was conducted following the declaration and approval of the Ethics Committee of CMH Lahore Medical College.

Sampling size and sampling technique

The sample size was calculated using a sample size calculator in health studies. Keeping the confidence level at 95% with a margin of error of 10%, the calculated sample size was 92.

Study procedure

The maternal nutrition knowledge was assessed through a structured questionnaire. The questionnaire is subdivided into three categories: (a) Knowledge about food ingredients, including sugar, fat, and salts; (b) Knowledge about specific dietary recommendations emphasizing the consumption of fresh fruits and vegetables and breastfeeding; and (c) Knowledge about the effects of not following recommended dietary practices. All the positive responses were summed up, and the mean was calculated; and the average was the cutoff value. Any result above that level will be considered a high level of knowledge while any below that value will be considered a low level of knowledge.^[14]

Child nutrition outcome was assessed using the WHO growth reference for a child under five to generate a HAZ. WHO HAZ refers to the SD from the median height of a child of the same age and sex in the reference population and has standard reference values. A child is considered stunted (extremely stunted, mild stunted) if the Z score is below the cutoff of -2 ($-3, -1$) SD below the reference population.^[15]

Statistical analysis

Google Form responses stored on a web-based database (Google Drive) were transferred to Microsoft Excel for

appropriate formatting. The data were imported for statistical analysis into the Statistical Package for the Social Sciences.

We applied a Chi-square test to correlate maternal nutritional knowledge with children's height and applied a paired *t*-test to find the associations among multiple variables under the study.

RESULTS

Table 1 shows the demographic data, including the age of mothers, maximum falling in the range of 20–25 years, and the age of children ranging from newborns to five years. The height of children is measured in cm and then plotted in SDs according to WHO HAZ graphs. About 38% of children have height falling in SD3. That is, they have a good height for their age. About 27% of mothers were educated up to the matric level, 25% had gone to college, and 15% had no formal education. About 54% of children were living in urban areas. Ninety-two per cent of mothers were housewives, and 8% belonged to different professions such as teaching, medicine, and private jobs.

Table 1 shows that a child's height has a significant association with maternal education (0.008), the mother's employment (0.04) status, and the area where the child belongs (0.02).

Table 2 shows the data about the questions asked to mothers to assess their knowledge regarding food ingredients, food recommendations, and the effects of not following the recommendations showing the frequency and percentage of responses. Table 3a also shows minimum and maximum scores gained by mothers in various categories based on the maximum right answers provided. Table 3b represents the data that 91% and 84% of mothers have a good knowledge about dietary recommendations and the consequences of not following them respectively. However, the knowledge about food ingredients and their nutritional value is relatively low (70%).

In Table 4 maternal knowledge and the child's height are compared. Graphs and table show that there is a very minor difference in the knowledge among the mothers of both the child with good height, that is, 2SD and the child with severe stunting, that is, >−2SD for all the categories of food ingredients, dietary recommendations, and consequences of not following them.

DISCUSSION

In our study, the prevalence of stunting and wasting under five years is 39% and 8%, respectively. According to data published in 2014, these values are higher for the Northern region, that is, 33.1% for stunting and 6.3 for wasting under the 5-year age group.^[15] Malnutrition is 3 times higher among the children of teenage mothers than children of adult mothers. This study shows no significant association

Table 1: Demographics of study participants.

	Frequency	Percentage	P-value
Age of the mother (years)			
20–25	21	22.8	0.185
26–30	45	48.9	
31–35	23	25.0	
36–40	3	3.3	
Total	92	100.0	
Age of child (months)			
0–12	30	32.6	
13–24	10	10.9	
25–36	31	33.7	
37–48	10	10.9	
49–60	11	12.0	
Total	92	100.0	
Height of child in SD			
3	35	38.0	
0	18	19.6	
−2	31	33.7	
−3	8	8.7	
Total	92	100.0	
Gender of child			
Female	35	38.0	0.01
Male	57	62.0	
Total	92	100.0	
Mother's education			
No formal education	14	15.2	0.008
Elementary	18	19.6	
Matric	25	27.2	
College	23	25.0	
University	12	13.0	
Total	92	100.0	
Address of child and mother			
Rural	42	45.7	0.02
Urban	50	54.3	
Total	92	100.0	
Mother's employment status			
Housewife	85	92.4	0.04
Teacher	2	2.2	
Doctor	1	1.1	
Office work	4	4.3	
Total	92	100.0	

SD: Standard deviation

of child health status with maternal age with *P* = 0.185. The prevalence of under nutrition among children of teenage mothers is higher as compared to children of mature mothers and this can be explained by having more experience in child care.^[16] A study by Nigatu, Assefa, and Woreta has similar findings of a lower incidence of stunting in children of older mothers than children of young mothers.^[17]

In Bangladesh, the prevalence of stunting among under five-year children is 36.3%. The highlighted risk factors include maternal education, low birth weight of the child, poor breastfeeding practices, and early-age infections.^[18]

Table 2: Questions evaluating the knowledge of respondents about nutrition and analysis of the responses.

	Frequency	Percentage	Correct answer
Assessing respondents' perceived perspective about ingredients constituting certain foods:			
What is your perception about the content of "added sugar" in the following foods?			
Yogurt (natural)	39	42.4	Low
Yogurt (flavored)	32	34.8	High
Fresh juice	34	37.0	Low
Bread (white)	48	52.2	Low
Ketchup	22	23.9	High
What is your perspective about the fat content in the following food items:			
Packed chips	31	33.7	High
Noodles	28	30.4	High
Raw nuts	45	48.9	High
White bread	68	73.9	Low
What is your understanding of the salt content in the food items mentioned below:			
Bread (white)	62	67.4	Low
Ketchup	11	12.0	High
Noodles	27	29.3	High
Assessing respondents' perceived perspective about dietary recommendations:			
Healthcare experts recommend eating a certain number of servings of fruit and vegetables per day. What is that number?	68	73.9	4-6
Infants should be exclusively breastfed for what duration?	91	98.9	6 months
Assessing respondents' perceived perspective about the impact of defecation from the recommended balanced diet:			
Do you understand the potential impact of not intaking/little intake of fresh vegetables and fruits?			
No	12	13.0	
Yes	80	87.0	
Being overweight can lead to health problems. Do you know any of those diseases?			
No	18	19.6	
Yes	74	80.4	
You consider your household food intake as:			
Very good	8	8.7	
Good	42	45.7	
Neutral	42	45.7	
Total	92	100	
What do you understand by the word "calorie"?			
I don't know	68	73.9	
It is a unit of energy	24	26.1	
Total	92	100	
Do you know foods that prevent anemia?			
No	8	8.7	
Yes	84	91.3	
Total	92	100	
Is there any effect of "no breastfeeding" on the child?			
Low weight	18	19.6	
Weak immunity	38	41.3	
Delayed achievement of developmental milestones	36	39.1	
Total	92	100	
Rate your knowledge of nutrition			
Very good	6	6.5	
Good	27	29.3	
Neutral	59	64.1	
Total	92	100	

Table 3: Maternal nutritional knowledge scores.

Table 3a: Mother's scores in various categories based on the maximum right answers.

	Scoring food ingredients	Scoring food recommendations	Scoring food health consequences
<i>n</i>	92	92	92
Mean	5.1196	4.2717	4.7826
Std. deviation	2.25731	0.51576	0.97017
Minimum	1.00	3.00	2.00
Maximum	11.00	6.00	6.00

Table 3b: Maternal dietary knowledge in various categories.

	Frequency	Percentage
Knowledge about food ingredients		
Low	22	23.9
High	70	76.1
Knowledge about dietary recommendations		
Low	1	1.1
High	91	98.9
Knowledge about the potential consequences of not adhering to dietary recommendations		
Low	8	8.7
High	84	91.3

Stunting is the major issue of concern globally. According to a report published in 2017, the prevalence of stunting in South Asia is around 38% and Pakistan is the second largest contributor with 43% prevalence, India at 48%, Bangladesh and Nepal at 41%, and Sri Lanka at 19%.^[19] Poor socioeconomic status is a risk factor for stunting. Studies indicate children living in slums, have poor sanitary practices, and a diet poor in dairy, fruits, and vegetables, which are strong indicators of stunting and early age growth restriction.^[20]

Women are in charge of the home and have autonomy in the household; they greatly influence the nutrition of their family members. This potentially leads to improved outcomes of nutritional status, physical, and mental growth of their children.^[21] Our data present a strong link between maternal knowledge and their children's health status with a $P = 0.008$. Children of educated mothers have good height and physical health. Similar data from other papers also prove that educated mothers are more capable of understanding the nutritional information of food, which influences their diet choices and ultimately leads to healthy feeding patterns.^[16]

Mother's employment status has a positive effect on a child's height, as shown in our study $P = 0.04$, a study conducted

in sub-Saharan Africa has similar comments related to maternal education and professional status; These factors have a great impact on a child's growth.^[22] In the areas of high malnutrition, maternal education and work status are impactful on a child's growth, as shown in a Nigerian study. According to Bangladesh Urban Health Survey data, the underweight status of children of mothers working in different professions is better than those of mothers living in the slums.^[23,24]

In our study, ten out of 35 female children have height in the range of $-2SD$ and $-3SD$, that is, 28% of the female study sample. Sixteen out of 57 male children have height in the range of $-2SD$ and $-3SD$, that is, 28% of the male study sample. Hence, there is an equal prevalence of malnutrition among the different genders. The percentage of stunting among those living in urban areas(28%) and those living in rural areas (30%) show a difference in health outcomes. These numbers show that kids living in urban areas have better access to nutritional food, excellent medical care facilities, and improved living standards than kids living in rural areas. This relationship between the height of the child and the area of residence is strongly observed in our study with $P = 0.02$. Other studies show a higher prevalence of malnutrition among children from rural schools than those from urban school children, with 70% malnutrition in Nasih *et al.* and 65% in Goyle *et al.*^[16,25]

We asked the mothers about their knowledge of common ingredients, and we did not find any influence of maternal knowledge about food ingredients on their child's height and health. Similar studies also proved that nutritional counseling was not effective in reducing stunting among young children. A meta-analysis showed that complementing nutritional education with interventions like food supplementation and safety net programs can effectively reduce stunting and improve the nutritional status of young children.^[26]

Maternal nutritional knowledge can influence the child's health to some extent, but other multiple factors also contribute to the overall outcome of the child's physical, mental, and social health status. Risk factors for poor nutritional status of the child can be low paternal education, short maternal height, <150 cm, advanced maternal age, and low birth weight babies.^[24] According to the WHO, short maternal height is a risk factor for child stunting.^[27] Young childbearing mothers are at more risk of intrauterine growth restriction, premature births, low birth weight babies, high mortality of mother and infant, and undernutrition.^[28]

Maternal knowledge about food ingredients has no association with a child's nutritional health. Healthy diets consist of balanced consumption of fruits, vegetables, meat, and dairy products. Even in the developed world, children in countries like The Netherlands do not consume the recommended amount of all these components.^[29] Studies

Table 4: Mother nutritional knowledge and child height in SD.

	Category food ingredients		Total	P-value	Chi-square value
	Low	High			
Height of child in SD					
2	8	27	35	0.07	0.993
0	3	15	18		
-2	9	22	31		
-3	2	6	8		
Total	22	70	92		
	Category food recommendations		Total	P-value	Chi-square value
	Low	High			
Height of child in SD					
2	0	35	35	0.00	4.156
0	1	17	18		
-2	0	31	31		
-3	0	8	8		
Total	1	91	92		
	Category health consequences		Total	P-value	Chi-square value
	Low	High			
Height of child in SD					
2	2	33	35	0.169	3.53
0	1	17	18		
-2	5	26	31		
-3	0	8	8		
Total	8	84	92		

+2 SD: Normal height for age, 0 SD: Median, -2SD: Mild stunted, -3 SD: Severe stunted, SD: Standard deviation

have reported that educated parents influence the dietary choices of children, like more fruit consumption than sugar sweetened beverages. Parental education plays a significant role in their child’s eating habits and food choices.^[30]

Research has highlighted the importance of optimal Infant and Young Child Feeding (IYCF) practices for the attainment of the best nutrition in early childhood. The WHO defines optimal IYCF practices as breastfeeding the child during the first hour following delivery, breastfeeding for the first six months of life and continuing till the age of 2 years, starting weaning after six months of age, including in the child’s food all necessary micro and macronutrients.^[31] Studies have pointed out that maternal education on feeding methods and counseling about the importance of breastfeeding can improve breastfeeding practices, and a child’s nutritional outcome.^[32]

Multi-sectoral interventions from both the healthcare sector and non-healthcare sector proved effective in the reduction of early childhood stunting.^[33] Strong basic health infrastructure improved nutritional interventions, maternal multiple micronutrient supplementation, and natal and postnatal maternal and fetal health. Improvement in reproductive health practices, increasing inter-pregnancy duration, prevention of early age infection, promoting breastfeeding practices for the first six months were all beneficial. Other sectoral efforts

such as improved economic conditions, parental education, good sanitary practices, WASH, and the introduction of IMNCI contribute remarkably to improving child HAZ scores in most countries. Non-health care sector contributes 47% in the reduction of stunting, along with healthcare centers contributing up to 37%.^[34]

Maternal knowledge about the health consequences of not following dietary recommendations has no positive association with child height. The global recommendation for exclusive breastfeeding is six months. Breastfeeding has both short-term and long-term health benefits; it provides immunity from multiple infections, including respiratory infections and gastrointestinal infections. It also protects from necrotizing enterocolitis the sudden infant death syndrome.^[33]

The body’s metabolism and nutritional requirements are higher during early growth years, which makes young children more vulnerable to micro and macronutrient deficiency, as shown in a study that indicates a significant prevalence of anemia among preschool children than in-school-going children.^[35] Anemia is more prevalent among under five year-old children due to dependence on their caretaker for food, personal hygiene, poor infection control, less developed immunity, inadequate diet, and

more vulnerability to infection, especially helminth infestation.^[36] Anemia can be prevented by paternal dietary education, interventions such as food fortification with micronutrients, iron supplementation, awareness campaigns about anemia, and its prevention at the school and domestic levels.^[37]

CONCLUSION

After the complete analysis, our study shows that a child's growth is influenced by socioeconomic factors such as the mother's education, employment, and area of residence but not specifically by maternal knowledge about food ingredients and various dietary recommendations. This signifies the importance of other factors such as genetics, ethnicity, nutrition, hormones, metabolism, medical conditions, and environmental factors contributing to a child's height and nutritional status. Early stunting and wasting at birth can lead to long-term growth failure in infancy and childhood. Thus, improving maternal nutrition during pregnancy can be beneficial in the prevention and control of stunting and wasting. Identifying high-risk groups of children with early-age stunting and wasting and prioritizing them for targeted treatment can prevent malnutrition and subsequent poor health outcomes. Stunting and wasting can be reduced with comprehensive policies, their coordinated application, along with awareness activities in the public healthcare sector.

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Transparency declaration

The lead author affirms that the article is an accurate, transparent, and honest study and that no important aspects of the study have been omitted.

Ethical approval

The research/study approved by the Institutional Review Board at CMH LAHORE MEDICAL & INSTITUTE OF DENTISTRY, number 112/ERC/CMHLMC, dated January 21, 2022.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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