Effectiveness of a Designed Dietary Educational Program on Maternal Nutritional Knowledge, Practices, and Anthropometric Outcomes of Their Children Under Five Years of Age

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ABSTRACT

Background: Healthy nutrition is essential for a child's growth and development, as it can maintain general health and weight gain. Optimal physical condition is crucial at every phase of life, especially through infancy and childhood. Mothers are the primary caregivers for their children during their early years, and this care is influenced by their nutritional knowledge and practices. **Aim**: The study aimed to evaluate the effect of a designed dietary educational program on maternal nutritional knowledge, practices, and anthropometric outcomes of their children under five years of age. **Subjects and Method:** The study sample consisted of 314 mothers having 314 children below 5 years of age. A purposive sampling study was used. A quasi-experimental design was employed in this study at the outpatient pediatric clinics and pediatric inpatient department of Hurghada Hospital in the Red Sea Governorate, Egypt. The data were collected using three tools: a nutritional knowledge questionnaire, a maternal reported practices assessment tool, and the child's anthropometric measurements. **Results:** Only a few of the mothers demonstrated good nutritional knowledge before the implementation of the program. However, after completing the program, this percentage increased to 32.5%. Before the program, around two-fifths of the mothers showed inadequate nutritional practices. In contrast, after the dietary program, nearly all mothers exhibited competence in their nutritional practices. Concerning children's anthropometric outcomes, the results showed a significant relation between children's length/height-for-age, weight-for-age, and body mass index for age, before and after the implementation of this program. **Conclusion:** Educational program significantly impacts a mother's nutritional knowledge and practices regarding their children. Moreover, children's length/height-for-age, weight-for-age, and BMI-for-age were positively affected by the dietary program. **Recommendation:** Implementation of a dietary program for mothers on children's nutrition at various ages and in different clinical settings to enhance overall benefits. And encourage mothers to regularly assess their children's anthropometric measurements to enhance their children's physical growth.

***Keywords*:** Anthropometric outcomes, Children under five years, dietary educational program, Maternal nutritional knowledge, practices.

INTRODUCTION

Nutritional health in children younger than five years is a critical health indicator. These young children are particularly vulnerable to nutritional deficiencies and other related health issues. Stunting among children reflects the long-term effects of undernutrition and infections. Children who are stunted have low height-for-age, often due to inadequate diets or recurrent illnesses, which will impair mental development, school performance, and overall cognitive capacity **(Ayed et al., 2021)**. Additionally, overweight children face health risks associated with obesity, such as diabetes and heart disease. Moreover, underweight among children under five years needs to be addressed, as it is essential for overall health and well-being. Mothers' nutritional knowledge and practice are crucial to providing proper nutrition during this critical period, as it is vital for optimal physical growth and early childhood development for those under five years **(Forh et al., 2022 & Sirasa et al., 2020).**

Improving mothers' knowledge of nutrition and their practices is essential for improving their children's physical growth. This is because inadequate mothers' nutritional knowledge and practices are the main reasons behind children's malnourishment or excessive use of unhealthy food. Obesity and overweight in children are serious global public health issues. It was commonly believed that "bigger is better" and that a heavy child was a healthy child. Evidence indicating that juvenile overweight and obesity are linked to several severe health issues, as well as a higher chance of developing an early illness and passing away later in life, has fundamentally altered this view (**Abd-Alrazig et al., 2023**). Malnourished children may experience immune system weakness and cognitive impairments, which may result in poor health outcomes, lost productivity in the future, and poor academic achievement. Mothers have the most important role in preventing nutritional problems, which must be resolved if children under five years reach their full potential and are healthy overall (**Abdulla et al., 2022 & Anato, 2022**).

Significance of the study

Childhood malnutrition, which includes stunting, underweight, wasting, obesity, and overweight, is one of the major global health risks **(WHO, 2021).** Nearly half of all child fatalities under the age of five worldwide are caused by undernutrition **(Global Nutrition Report, 2018).** To end hunger, guarantee food security, and enhancing nutrition is the second Sustainable Development Goal (SDG 2) **(WHO, 2021).** It aims to eradicate all forms of malnutrition and achieve the global goal of reducing the number of children under five who suffer from stunting to 89 million by 2030. Over the past decade, there has been a notable decline in childhood malnutrition in Egypt. Between 2012 and 2022, the prevalence of stunting dropped from 24.6% to 20.4%. This percentage still falls within the 'high' group (20% to less than 30%) by the WHO Child Growth Standards **(UNICEF, WHO, World Bank, 2023).** So, to preserve child health and physical growth, it is critical to examine and assess mothers' nutritional knowledge and practices, as inadequate knowledge and practices harm a child's growth and development. There is a high correlation between a mother's nutritional knowledge and her children's growth. Mothers' practices are impacted by their knowledge and skill levels, which ultimately affect children's anthropometric outcomes and support the success of malnutrition prevention efforts **(United Nations Second Report on the World Nutrition Situation, 2017).**

AIM OF THE STUDY

To evaluate the effect of a designed dietary educational program on maternal nutritional knowledge, practice, and anthropometric outcomes of their children under five years of age.

Research hypothesis:

1. Implementing a dietary educational program is anticipated to substantially improve mothers' nutritional understanding and practices regarding their children under five.
2. Implementing a dietary educational program is anticipated to improve children's anthropometric outcomes.

SUBJECTS AND METHOD

Research desig:

A quasi-experimental design was employed in this study, featuring both pre-tests and follow-up assessments to enhance the validity of the findings.

Setting:

The study took place at the outpatient pediatric clinics and the pediatric inpatient department of Hurghada Hospital in the Red Sea Governorate, Egypt. These locations were selected because they serve the country's most populous region.

Subjects:

A purposive sampling technique was used in the study, involving 314 mothers with their accompanying 314 children under five years. Those who were present at the aforementioned location and met the specified inclusion and exclusion criteria**.**

Inclusion criteria:

mothers of all children above 6 months and under five years, companying with their children, the children were not diagnosed with disease like; diabetes type 1, phenylketonuria, autism spectrum disorder, chronic kidney disease, congenital heart disease, sickle cell disease, cancer, or growth retardation.

Tools for Data Collection:

Tool I: Nutritional Knowledge Questionnaire: This tool, used to assess mothers` nutritional knowledge of their children under five years of age. It was developed by researchers guided by WHO **(2023), Manzour et al. (2019), and Siagian and Halisitijayani (2015).** It consisted of two parts:

Part I: assessed socioeconomic demographic characteristics of mothers and their children, including their age, marital status, educational level, working status, family income, and their residence; additionally, the child's age and gender.

Part II: assessed mothers' nutritional knowledge. This tool consists of 45 statements, organized into four domains: probed nutritional requirements, balanced diet, factors affecting children's nutrition, and nutritional problems. The scoring for nutritional knowledge items was "2","1", and "0" for agree, disagree, and don't know, respectively. Each correct answer (agree) was scored by "one", and each incorrect answer (disagree & don`t know) was scored by "zero". The nutritional knowledge for mothers was calculated and categorized into good scores ≥ 30, fair from 15 ≤ 30, and poor scores ≤ 15 (**Pinto et al., 2023).**

Tool II: Maternal Reported Practices Assessment Tool: This tool was developed by researchers guided by WHO **(2023), Manzour et al. (2019), and Siagian and Halisitijayani (2015).** It was used to assess mothers' nutritional practices. It encompasses 35 key items related to appropriate and healthy nutrition for children, including the timing and types of solid food introduction for infants, strategies to enhance children's appetite, daily meal frequency, instances of daily meal cancellation, and the availability of daily snacks. For maternal nutritional practices, a score of zero or one was given to each answer of each tool item, and it was plotted under the categories of competent ≥ 20 and incompetent ≤ 20.

Tool III: Child's Anthropometric measurements: These indicators were used to assess the children's physical growth by calculating anthropometric measurements, including their weight, length/height, and body mass index (BMI). **(Chadha & Warady, 2022).** Weight in kg was measured by a beam on a mechanical weight scale ZT-160. The child was weighed in light clothing without shoes. Length/Height in cm was measured lying down for children aged <24 months using a graded measuring tape and standing up for children aged 24–59 months, using a calibrated stadiometer. The child stood barefoot on the platform with feet positioned parallel and key body points, heels, buttocks, shoulders, and the back of the head in contact with the stadiometer. The head was held in

an upright, natural position, and the arms rested loosely at the sides. The measuring arm was then gently lowered to rest on the top of the child's head. The red indicator provided a precise height measurement, recorded to the nearest millimeter. Regarding BMI, it was determined using the recorded length/height and weight measurements of each child as follows: BMI =Weight in Kg / (Height in meters)^2 **(National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion, 2000; Centers for Disease Control and Prevention, 2010).**

Scoring System:

Using percentiles to define BMI categories in children is important because they are still growing. It was classified according to the WHO Child Growth Standards **(WHO, 2025)** and the **CDC (2024),** using Girls' chart-BMI-for-age: Birth to 5 years (percentiles) and Boys' chart-BMI-for-age: Birth to 5 years (percentiles) as follows:

- Underweight: when BMI-for-age was Less than the 5th percentile
- Healthy Weight: when BMI-for-age was 5th percentile to less than the 85th percentile.
- Overweight: when BMI-for-age was 85th percentile to less than the 95th percentile.
- Obesity: when BMI-for-age was 95th percentile or greater.

Regarding Weight-for-Age Charts: birth to 5 years (Percentile) Classifications according to the WHO Child Growth Standards **(WHO, 2025)** are as follows:

- Above 97th percentile: Overweight
- 3rd to 97th percentile: Normal weight
- Below 3rd percentile: Underweight

Regarding Length/Height-for-Age Charts: birth to 5 years (Percentile) Classifications according to the WHO Child Growth Standards **(WHO, 2025),** as follows:

- Below the 3rd percentile: Indicates stunted growth (short stature for age).
- Between the 3rd and 97th percentiles: Considered normal or healthy growth.
- Above the 97th percentile: May indicate tall stature for age.

Validity of the tools:

The content validity of the instruments was confirmed by a panel of five expert professors (one is a professor in the specialty of nutritional medicine, and four expert

professors in the field of pediatric nursing assessed the tools to ensure content validity through a thorough review process, and any necessary modifications were made.

Reliability of the tools:

The tools were examined by the researchers through an analysis of internal consistency, utilizing Cronbach's alpha coefficient. The reliability coefficient for Tool I was 0.81, and for Tool II was 0.92.

Pilot study of the research:

A pilot study was carried out involving 10% of the mothers and their children (30 mothers with their children under age five**)** at the outpatient pediatric clinics and pediatric inpatient department of Hurghada Hospital, Red Sea Governorate, Egypt, to assess the clarity, suitability of the study process, as well as the time required for tools completion. The essential adjustments, omissions and additions were made in response to the pilot's results.

Data Collection Procedure:

The dietary educational program aimed to improve mothers' nutritional knowledge, practices, and anthropometric outcomes of their children under five years old. The program was implemented at the previously mentioned settings. It was completed over two months. The post-test phase began two months after the implementation of the program and took one month as the pre-test phase. The program phases started from the beginning of November 2024 to the end of April 2025, three days a week, from 9 a.m. to 12 p.m. To enhance contact, 35 subgroups of mothers were created, each consisting of nine mothers accompanied by their children under five years, except for the last group, which included eight mothers with their children. Each subgroup received a total of three sessions, each lasting between 35 and 45 minutes.

Instructional methods were used, including lectures, group discussions, role acting, instructive images, and movies, have were employed throughout the educational

program. The researchers employed several forms of reinforcement for the mother and their children, including delivering various fruits, toys, and encouraging comments. The researchers summarized the session's content and asked the mothers if they had any questions. The researchers gave the mothers a written Arabic booklet of the dietary program that contains all the information needed about the proper nutrition of their children under 5 years to improve their nutritional knowledge and practices about their children`s nutrition, which in turn affects their anthropometric outcomes. The execution of the current study was carried out in three stages: the assessment phase, the implementation phase, and the evaluation phase.

I- Assessment Phase:

The data-gathering instruments were provided by the researchers to perform pre-tests, and they provided them with a full clarification of the research's background and goals. Each tool took approximately 15-20 minutes to complete on average. The data were collected from the mothers and their children through the face-to-face interview method during the regular checkup visits to the pediatric outpatient clinic and those who were admitted to pediatric inpatient department with their children to interview and fill out the interview sheet (mothers' nutritional knowledge and reported practices about their children's nutrition) and demonstrate the child's anthropometric measurements. The program's material was developed depending on an evaluation of the mothers and their under-five children being examined and their actual educational needs.

II. Implementation Phase :

The researchers initiated the educational program after explaining the study's purpose and procedures to the mothers of children under five years of age .The program was implemented as follows: Train the target mothers who came to the pediatric outpatient clinic and were admitted to the pediatric inpatient department about their nutritional knowledge and reported practices assessment tool related to their children's nutrition and its impact on the children`s anthropometric outcomes. Through three

sessions (knowledge, practices, and assessment of the children`s anthropometric outcomes)

Dietary Educational Program Sessions: Before starting the sessions, there was a meeting with the mothers to clarify the objectives, duration, and timing of the sessions. The researchers explained the purpose of the program and outlined its content through direct personal communication.

Session 1: This session aimed to help mothers gain knowledge about the appropriate nutritional requirements for their children, their knowledge about a balanced diet for their children, factors affecting their nutrition, and the effect of nutrition on children's physical growth.

Session 2: It was dedicated to assessing mothers' reported practices regarding the nutrition of their children and feeding methodologies. Key topics for discussion include the initiation of weaning, the selection of foods introduced during this phase, cooking techniques, strategies for enhancing children's appetite, the frequency of daily meals, the incorporation of flavors into foods, and other relevant practices. Each of these areas was carefully presented and examined with mothers to determine which practices are appropriate for implementation or should be avoided.

Session 3: to evaluate the influence of the dietary program on maternal nutritional knowledge and practices of their children under 5 years and their anthropometric outcomes by examining anthropometric parameters, including weight, height/length, and body mass index.

III. Evaluation phase:

Two months after the program's implementation, the researchers engaged with mothers and their children to conduct a post-test. This assessment utilized three tools to evaluate the effectiveness of the dietary program and to gather insights into the mothers' knowledge and practices regarding the nutrition of their children and the anthropometric outcomes under the age of five.

Ethical Considerations:

Ethical approval was obtained from the Faculty of Nursing, Port Said University, ethical committee (NUR 10/10/2024). All ethical considerations were addressed in this study. Mothers were allowed to provide their verbal consent to participate after being informed about the study's objectives. The researchers clarified that participation was entirely voluntary; mothers retained the right to decline involvement or withdraw from the study at any point without explanation. Furthermore, they were assured that all data collected would be kept strictly confidential and utilized solely for research purposes.

Statistical Analysis:

The collected data were computerized and analyzed using IBM SPSS Statistics Version 29. Data analysis involved the use of both descriptive and inferential statistical methods. The t-test was utilized for continuous variables, while the Chi-square test was applied to categorical variables. The Spearman-Brown formula and Pearson correlation coefficients were calculated to examine relationships between variables.

RESULTS

Table 1 presents the sociodemographic characteristics of mothers and their children, which indicates that 33.8% held a bachelor’s degree. Additionally, more than half (55.4%) of the mothers lived in urban areas. In terms of employment, about three-quarters (72.6%) of mothers were working. It was also noted that 50.5% of the participants were married, and 54.5% of them reported having insufficient family income. The sociodemographic data for the children in the study reveal that 51.6% were male. Additionally, 33.6% of the children were aged more than 3-4 years.

Table 2 reveals statistically significant relationships between mothers' knowledge and several important aspects of children's nutrition, including nutritional requirements, understanding of a balanced diet, and the factors that influence child nutrition, with p-values of 0.000, 0.041, and 0.016, respectively. Furthermore, the data indicates that before the program, only four mothers demonstrated an understanding of potential

nutritional issues affecting children. However, following the program implementation, this number increased to 13.7%, reflecting a notable enhancement in nutritional knowledge among the mothers after the program implementation.

Table 3: The findings indicated a statistically significant relationship between the total maternal nutritional practices before and after the implementation of the program in several areas related to child nutrition. Specifically, the p-values obtained were 0.050 regarding appropriate and healthy nutrition for children, 0.034 concerning the timing of food introduction to infants, 0.048 for the types of foods introduced, 0.034 for strategies aimed at enhancing children's appetite, and 0.013 for instances of daily meals cancellation.

Table 4 illustrates the relationship between children's anthropometric measurements before and after program implementation. There are statistically significant relations between children's length/height-for-age, weight-for-age, and BMI-for-age before and after the implementation of this dietary program, with a p-value of 0.000 for each indicator.

Table 5 reveals statistically significant relations between total mothers' knowledge and their marital status, education, working conditions, and income, with p-values of 0.022, 0.013, 0.048, 0.012, and 0.00, respectively.

Table 6: clarifies statistically significant relations between total mothers' nutritional practices before and after the implementation of the dietary program, and their marital status, education, working conditions, and family income, as well as the mother's occupation, with p-values of 0.015, 0.056, 0.002, and 0.000, respectively.

Table 7 presents the correlation coefficients between mothers' nutritional knowledge, practices, and their children's anthropometric measurements following the implementation of the dietary program. Statistically positive correlations were observed among maternal nutritional knowledge, practices, and children's weight-for-age and BMI-for-age, with corresponding p-values of 0.003 and 0.014, respectively, after program

implementation. In contrast, mothers' nutritional practices showed statistically significant correlations with children's weight-for-age and BMI-for-age, with p-values of 0.006 and 0.045, respectively.

Table (1): Frequency distribution of the mothers and their children according to their sociodemographic characteristics, n=314

Demographic characteristics	NO	%
Age (years):	**33.92 ± 6.94**	
Educational level:		
• Illiterate	12	3.8
• Read and write	7	2.2
• Primary school	11	3.5
• Secondary school	93	29.6
• Bachelor's degree	106	33.8
• Master/PhD	85	27.1
Residence:		
• Urban	174	55.4
• Rural	140	44.6
Marital Status:		
• Married	96	50.5
• Divorced	65	34.2
• Widow	29	15.3
Family income:		
• Enough	143	45.5
• Not enough	171	54.5
Mother`s Working Status:		
• Working	228	72.6
• Not Working	86	27.4
Child's age:		
• More than 6 months - 1 year	25	7.96
• More than 1 year - 2 years	48	15.3
• More than 2 - 3 years	88	28.0
• More than 3-4 years	105	33.4
• More than 4 to less than 5	48	15.3
M±SD	**3.9±0.89**	
Child`s Gender		
• Male	162	51.6
• Female	152	48.4

Table (2): Frequency distribution of the mothers` nutritional knowledge before and after the program implementation. n=314.

Items	Mothers' Nutritional Knowledge Pre-Program						Mothers' Nutritional Knowledge Post-Program						X^2	P-Value
	Poor		Fair		Good		Poor		Fair		Good			
	No	%	No	%	No	%	No	%	No	%	No	%		
Nutritional Requirements														
Poor	168	88.4	0	0.0	0	0.0	56	78.9	54	38.3	58	56.9		
Fair	8	4.2	83	88.3	0	0.0	7	9.9	66	46.8	18	17.6	31.6	**0.000***
Good	14	7.4	11	11.7	30	100.	8	11.3	21	14.9	26	25.5		
Balanced Diet														
Poor	78	41.1	44	46.8	12	40.0	56	78.9	54	38.3	58	56.9		
Fair	93	48.9	41	43.6	14	46.7	7	9.9	66	46.8	18	17.6	7.45	**0.041***
Good	19	10.0	9	9.6	4	13.3	8	11.3	21	14.9	26	25.5		
Factors Affecting Child Nutrition														
Poor	66	34.7	45	47.9	12	40.0	20	28.2	60	42.6	43	42.2		
Fair	115	60.5	43	45.7	17	56.7	49	69.0	69	48.9	57	55.9	12.17	**0.016***
Good	9	4.7	6	6.4	1	3.3	2	2.8	12	8.5	2	2.0		
Nutritional Problems														
Poor	65	34.2	44	46.8	12	40.0	24	33.8	58	41.1	39	38.2		
Fair	88	46.3	43	45.7	14	46.7	32	45.1	64	45.4	49	48.0	2.82	0.587
Good	37	19.5	7	7.4	4	13.3	15	21.1	19	13.5	14	13.7		
Total	**190**	**60.5**	**94**	**29.9**	**30**	**9.6**	**71**	**22.6**	**141**	**44.9**	**102**	**32.5**		
Mean ± SD	**41.45 ± 11.73**						**55.56 ± 11.41**							

(*) Statistically Significant (p-value ≤0.05)

Table (3): Frequency distribution of mothers` practices regarding children's nutrition before and after the program implementation, n=314.

Items	Total Mothers` Nutritional Practices								X^2	P-Value
	Pre-program				Post-program					
	Incompetent		Competent		Incompetent		Competent			
	No	%	No	%	No	%	No	%		
Appropriate and Healthy Nutrition for Children										
Incompetent	76	61.8	122	63.9	8	26.7	80	28.2	0.862	**0.050***
Competent	47	38.2	69	36.1	22	73.3	204	71.8		
Timing of Introducing Foods to Infants										
Incompetent	92	74.8	142	74.3	5	16.7	102	35.9	4.48	**.034***
Competent	31	25.2	49	25.7	25	83.3	182	64.1		
Types of Foods that are introduced to infants										
Incompetent	72	58.5	105	55.0	10	33.3	100	35.2	1.838	**0.048***
Competent	51	41.5	86	45.0	20	66.7	184	64.8		
Strategies to enhance children's appetite										
Incompetent	68	55.3	106	55.5	8	26.7	80	28.2	2.96	**0.034***
Competent	55	44.7	85	44.5	22	73.3	204	71.8		
Frequency of Daily Meals										
Incompetent	80	65.0	124	64.9	16	53.3	154	54.2	1.08	0.068
Competent	43	35.0	67	35.1	14	46.7	130	45.8		
Availability of Daily Snacks										
Incompetent	83	67.5	141	73.8	7	23.3	80	28.2	.574	0.317
Competent	40	32.5	50	26.2	23	76.7	204	71.8		
Instances of Daily Meal Cancellations										
Incompetent	77	62.6	114	59.7	7	23.3	80	28.2	4.18	**0.013***
Competent	46	37.4	77	40.3	23	76.7	204	71.8		
Total	**123**	**39.2**	**191**	**60.8**	**30**	**9.6**	**284**	**90.4**		
Mean ± SD	**22.50 ± 4.00**				**32.14 ± 4.07**					

(*) Statistically Significant (p-value ≤0.05)

Table (4): Relation between Anthropometric measurements of children under 5 years before and after the program implementation, n=314.

Items	Anthropometric measurements				X^2	P-Value
	Pre-program		Post-program			
	No	%	No	%		
Length/Height for Age (HFA):						
Stunting	213	67.8	173	55.1	44.63	**0.000***
Normal	65	20.7	105	33.4		
Tall	36	11.5	36	11.5		
Weight for Age (WFA):						
Underweight	127	40.4	17	5.4	48.76	**0.000***
Overweight	125	39.8	81	25.8		
Normal	62	19.7	216	68.8		
BMI for Age (BFA):						
Underweight	75	31.1	17	5.4	53.44	**0.000***
Overweight	75	31.1	38	12.1		
Obese	55	22.8	29	12.0		
Healthy weight	36	14.9	157	65.1		

(*) Statistically Significant (p-value ≤0.05)

Table (5): Relations between mothers` total nutritional knowledge and their sociodemographic characteristics before and after the implementation of the educational program (n=314).

Items	Mothers` total knowledge pre-program						Mothers' total knowledge post-program						X^2	P-Value
	Poor		Fair		Good		Poor		Fair		Good			
	No	%	No	%	No	%	No	%	No	%	No	%		
Marital Status:														
Married	96	50.5	44	46.8	18	60.0	43	60.6	69	48.9	46	45.1	6.45	**0.022***
Divorced	65	34.2	36	38.3	7	23.3	23	32.4	48	34.0	37	36.3		
Widow	29	15.3	14	14.9	5	16.7	5	7.0	24	17.0	19	18.6		
Mothers` Education:														
Illiterate	6	3.2	5	5.3	1	3.3	4	5.6	6	4.3	2	2.0	11.12	**0.013***
Read and write	4	2.1	2	2.1	1	3.3	2	2.8	3	2.1	2	2.0		
Primary school	5	2.6	3	3.2	3	10.0	2	2.8	4	2.8	5	4.9		
Secondary school	53	27.9	31	33.	9	30.0	18	25.4	43	30.5	32	31.4		
Bachelor	67	35.3	26	27.7	13	43.3	27	38.0	40	28.4	39	38.2		
Master/PhD	55	28.9	27	28.7	3	10.0	18	25.4	45	31.9	22	21.6		
Working Condition:														
Working	143	75.3	63	67.0	22	73.3	47	66.2	98	69.5	83	81.4	6.09	**0.048***
Not Working	47	24.7	31	33.0	8	26.7	24	33.8	43	30.5	19	18.6		
Mother's Income:														
Enough	91	47.9	40	42.6	12	40.0	34	47.9	52	36.9	57	55.9	8.82	**0.012***
Not Enough	99	52.1	54	57.4	18	60.0	37	52.1	89	63.1	45	44.1		
Total	**190**	**100.0**	**94**	**100.**	**30**	**100**	**71**	**100**	**141**	**100.**	**102**	**100.**		

(*) Statistically Significant (p-value ≤0.05)

Table (6): Correlations between mothers` total nutritional practices and their sociodemographic characteristics, before and after the implementation of the program. n=314

Items	Total Mothers` Nutritional Practices								X^2	P-Value
	Pre-program				Post-program					
	Incompetent		Competent		Incompetent		Competent			
	No	%	No	%	No	%	No	%		
Marital Status:										
Married	58	47.2	100	52.4	20	66.7	138	48.6	8.11	**0.015***
Divorced	44	35.8	64	33.5	4	13.3	104	36.6		
Widow	21	17.1	27	14.1	6	20.0	42	14.8		
Mothers` Education:										
Illiterate	7	5.7	5	2.6	0	0.0	12	4.2	9.23	**0.056***
Read and write	4	3.3	3	1.6	2	6.7	5	1.8		
Primary school	3	2.4	8	4.2	1	3.3	10	3.5		
Secondary school	28	22.8	65	34.0	9	30.0	84	29.6		
Bachelor's degree	42	34.1	64	33.5	6	20.0	100	35.2		
Master/PhD	39	31.7	46	24.1	12	40.0	73	25.7		
Mothers' Working Status:										
Working	87	70.7	141	73.8	19	63.3	209	73.6	15.53	**0.002***
Not Working	36	29.3	50	26.2	11	36.7	75	26.4		
Family Income:										
Enough	55	44.7	88	46.1	15	50.0	128	45.1	18.45	**0.000***
Not Enough	68	55.3	103	53.9	15	50.0	156	54.9		
Total	**123**	**100.0**	**191**	**100.0**	**30**	**100.0**	**284**	**100.0**		

(*) Statistically Significant (p-value ≤0.05)

Table (7): Correlations between mothers' nutritional knowledge, practices, and children's anthropometric measurements, n=314.

Anthropometric measurements	Mothers` Nutritional Knowledge				Mothers` Nutritional Practice			
	Pre-program		Post-program		Pre-program		Post-program	
	R	P	R	P	r	P	r	P
Weight for Age	-0.035	0.542	**0.334**	**0.003***	0.035	0.434	**-.082**	**0.006***
Length/Height for Age	**-0.131**	**0.020***	0.168	**0.054**	0.024	0.667	0.921	0.147
BMI for Age	-0.058	0.304	**0.809**	**0.014***	0.072	0.206	**0.426**	**0.045***

(*) Statistically Significant (p-value ≤0.05)

DISCUSSION

Malnutrition among children under five years is a health concern. Inadequate maternal nutritional knowledge and poor feeding practices contribute to childhood undernutrition. Mothers play a crucial role in ensuring the appropriate physical growth of their children. This study evaluates the effectiveness of a dietary educational program tailored for mothers of children under five, aiming to enhance their nutritional knowledge and feeding practices, and ultimately improve the anthropometric outcomes of their children (**Ayed et al., 2021).**

The present study showed that a few of the studied mothers demonstrated good nutritional knowledge before the implementation of the educational program. This result was supported by a group of researchers, namely, **Eidan and Shawq (2024) and Bassam and Nassar (2021).** They stated that before dietary intervention, mothers generally showed limited nutritional knowledge. Conversely, this finding contradicts **Faeq et al. (2023**) and **Raji et al. (2020),** who indicated that, in terms of overall knowledge scores, the majority of mothers demonstrated a moderate to high level of knowledge before dietary educational program implementation.

In relation to sociodemographic characteristics of the mothers, the results of the current study displayed that there were statistically significant differences between mothers` nutritional knowledge and their sociodemographic characteristics, including mothers' education, working condition, marital status, and their income. These results may be explained in light of researchers' points of view, as educated mothers are more aware of their children's nutritional needs and meal composition, and they have greater access to and ability to consult various sources of information regarding their children's nutrition. In addition, the higher level of mothers' education, as seen in Table 1, leads to an increase in knowledge about nutrition for children. These findings were in the same line with **Aljohani & Aljohani, (2020)**, who found that there is a relation between nutritional knowledge score of mothers and their age, educational level, and monthly income, while no significant relation was found with the mother's employment status. Conversely, the findings of this study are consistent with **Faeq et al. (2023**), who revealed that both the mother's education level and employment status were significantly associated with the overall nutritional knowledge score. The results agreed with **Almoabadi and Hanbazaza, (2024**). The findings indicated that mothers generally demonstrated a good understanding of children's nutrition and maintained positive dietary habits for their preschool-aged children. This knowledge was influenced by various demographic factors, including employed mothers and those with higher incomes.

Child feeding practices, influenced by family socioeconomic features, significantly affect nutritional outcomes. In other words, increasing household income, improving maternal education, and enhancing family knowledge and skills related to child nutrition **(Genalle, 2022).** The results of the present study demonstrated a statistically significant difference between overall maternal nutritional practices and all aspects of socio-demographic items, including marital status, mothers' education, working condition, and family income. From the researcher's perspective, this may be attributed to the fact that higher household income enables mothers to better afford the nutritional needs of their children. This finding is consistent with **Ravikumar et al. (2022),** who concluded that working mothers with greater financial resources may have more opportunities to participate in scientific seminars or conferences related to children's nutrition, thereby enhancing their nutritional knowledge and practices, which in turn positively influences children's physical growth. These results agreed with **Nsiah-Asamoah et al. (2019**), who noted that employed mothers may acquire experience and share new information with colleagues in the workplace. In addition, **Wahyuntari and Dewi (2021)** emphasized that income levels are closely linked to both the quality and quantity of food consumed. Lower income limits purchasing power, reduces overall household food intake, and negatively affects children's health. These results disagreed with **Ergün & Bozdemir, (2023**), who indicated that mothers who work full-time may experience stress that negatively impacts their attitudes toward maintaining healthy eating habits for their children. This trend is particularly pronounced when compared to mothers who are unemployed or work part-time. The demands of long work hours can also limit opportunities for these mothers to seek updated information regarding food technology and nutrition for their children's health.

The current study indicates a significant correlation between the nutritional practices of mothers and the educational level attained by these mothers. This finding emphasizes the essential role of education in shaping maternal approaches to nutrition. The results agreed with **Almoabadi and Hanbazaza (2024**), who displayed that mothers with higher educational levels are more capable of making informed decisions regarding

healthy food selections and are better able to identify the components of different food products.

The current study demonstrated a notable improvement in mothers' knowledge regarding several critical aspects of nutritional requirements. This includes a better understanding of balanced diets as well as the factors that influence child nutrition. The findings indicated a statistically significant relationship between the total maternal practices before and after the implementation of the program in several areas related to child nutrition, specifically, the areas include appropriate and healthy nutrition for children, the timing of food introduction to infants, the types of foods introduced, and strategies aimed at enhancing children's appetite. In addition, the results clarified that there was improvement in the mothers` practices related to the frequency of daily meals and provision of snacks to their children. From the researchers' perspective, the mothers held several misconceptions about healthy nutrition for their children and often opted for familiar, comfortable choices that encouraged their children to eat. As a result, the children were consuming inadequate fruits, vegetables, and proteins, leading the mothers to favor fast food options. However, these misconceptions were addressed following the program, enabling mothers to monitor their children's food intake more effectively and adopt strategies that promote healthy appetites throughout the entire day. These findings aligned with **Setia et al. (2020),** who stressed that an improvement in positive practices related to healthy food choices and behaviors follows a two-month nutrition intervention program. Moreover, a study by **Kusrini et al. (2020)** clarified that Insufficient knowledge of mothers about the nutrition of their children can impact their attitudes and behavior in providing food to children, which causes nutritional imbalances needed by children, so that the children have poor nutritional status. These results were in the same line with **Fatema (2023),** who mentioned that the knowledgeable mother is more likely to choose the appropriate foods, provide snacks, and feed her children healthy foods. And agree with the results of **Eidan and Shawq (2024)** who explained in their study that the practices of mothers related to essential components of a balanced diet and improve the child’s preferences and enhance their appetite, as well as they also found that most mothers are very cautious about the presence of carbohydrates and protein in their child’s

everyday meals. In this respect, research demonstrates the significant impact of maternal nutritional knowledge on children's dietary habits. Mothers with higher nutritional knowledge positively influence their children's growth and dietary behaviors **(Ayed et al., 2021; Kumara et al., 2020). Prasetyo et al (2023)** added that nutrition education for mothers has been shown to improve their knowledge and practices, leading to better nutritional outcomes for their children, including increased birth weight**.** Furthermore, the early years of children's lives are crucial for shaping dietary habits, with parents' nutritional knowledge playing a key role in children's food choices. Children with high nutritional knowledge tend to consume more fruits, vegetables, whole grains, and legumes, while those of parents lacking nutritional knowledge are more likely to consume sweets and cold cuts **(Rolf et al., 2024).**

Maternal education plays a vital role in improving anthropometric outcomes. Children with less educated mothers are more likely to experience stunting **(Seran & Sengkoen, 2024).** These findings were in accordance with the present study results, as significant relationships among children's height-for-age, weight-for-age, and BMI for age, before and after the implementation of the dietary program, were found. In this regard, **Lombamo et al. (2024)** reported significant improvements in child anthropometric outcomes, such as mean BMI-for-age Z-scores and prevalence of child wasting, for the intervention group after the nutritional intervention.

The findings of this study indicated a significant statistical negative correlation between mothers' knowledge and their children's weight-for-age, length/height-for-age, and body mass index (BMI). These findings go with **Ayed et al (2021)**, who mentioned that a significant positive correlation was found among the mothers' knowledge and practices as well as the children`s weight for age. Moreover, this study's outcomes demonstrate a significant statistical correlation between mothers' nutritional practices regarding their children's nutrition and two key growth indicators: weight-for-age and BMI. This suggests that the nutrition provided by mothers is essential for promoting healthy growth and development in children. However, the study did not detect a meaningful statistical relationship with weight-for-age, which implies that other factors

may influence this specific aspect of children's health. These results disagree with **Ratala et al. (2024)** clarified that a significant correlation was identified between children's nutritional practices and their weight for age.

In short, the findings of the current study revealed that the total mothers` knowledge and practice about their children's nutrition significantly improved after the implementation of the educational program. From the researcher's perspective, this may be attributed to the fact that a large percentage of the mothers studied hold a bachelor's degree. All of them expressed a strong intention to acquire more information about their children's nutrition to improve their children's nutritional status. Additionally, the mothers received an Arabic language booklet on nutrition for children under five years old during the educational program. These results were in agreement with **Eidan and Shawq (2024) and Fatima et al. (2024),** who highlighted that mothers possessed a strong understanding of balanced diets, nutritional content of foods, and appropriate cooking practices for their children. Furthermore, the findings indicated that these mothers implemented positive changes in their dietary practices to ensure the maintenance of good nutrition for their children. These changes affect children's anthropometric outcomes as seen in the study.

Study Limitation:

A significant number of cases were identified after enrollment in the study, revealing that some participants had children diagnosed with metabolic diseases. This issue hindered the researchers from including these cases in the sample, requiring them to avoid these participants and instead enroll others who met the inclusion criteria, which necessitated additional effort.

CONCLUSION

The current study concluded that the dietary educational program significantly influences a mother`s nutritional knowledge and practices, as there were statistically significant relationships between maternal nutritional knowledge and practices before and after the program implementation. Moreover, the anthropometric outcomes were

positively affected by the dietary program, as there were statistically significant relations between children's length/height-for-age, weight-for-age, and BMI-for-age before and after the implementation of the program, with a p-value of 0.000 for each indicator.

RECOMMENDATION

In light of the results of this study, the following recommendations were suggested:

- Implementation of a program for mothers on children's nutrition at various ages and in different clinical settings to enhance overall benefits.
- Replication of the current study on a larger probability sample is recommended for generalized results.
- Encouraging mothers to regularly monitor their children's anthropometric measurements to enhance physical growth.
- Provide a simple Arabic language booklet about nutrition for children under 5 years old should be available to mothers in health service locations, such as maternity and child health (MCH) centers, outpatient pediatric clinics, and pediatric inpatient departments. This booklet will serve as a helpful reference for mothers to understand proper nutrition for their young children.

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فعالية برنامج تعليمي غذائي مُصمم على المعرفة والممارسات الغذائية للأمهات ونتائج القياسات الأنثروبومترية لأطفالهن دون سن الخامسة

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[1]استاذ مساعد تمريض اطفال، كلية تمريض جامعة بورسعيد ، عميد معهد تمريض الجونة، البحر الأحمر، مصر، [2]مدرس تمريض اطفال، كلية تمريض جامعة دمياط ، مصر، [3]استاذ مساعد تمريض اطفال، كلية تمريض جامعة قناة السويس ، مصر، كلية التمريض الشمالية الخاصة بالمملكة العربية السعودية ، [4]مدرس تمريض صحة مجتمع، كلية تمريض جامعة كفر الشيخ ، مصر، كلية التمريض الشمالية الخاصة بالمملكة العربية السعودية، [5]استاذ مساعد تمريض الأطفال، كلية التمريض جامعة بورسعيد ، مصر.

الملخص

الخلفية: التغذية الصحية ضرورية لنمو الطفل وتطوره، حيث يمكنها الحفاظ على الصحة العامة وزيادة الوزن. الحالة البدنية المثلى حاسمة في كل مرحلة من مراحل الحياة، خاصة خلال فترة الرضاعة والطفولة. الأمهات هن المقدمات الرئيسيات للرعاية لأطفالهن خلال سنواتهم الأولى، وتتأثر هذه الرعاية بمعرفة الأمهات وممارساتهن الغذائية. **الهدف:** هدفت الدراسة إلى تقييم تأثير برنامج تعليمي غذائي مصمم على معرفة الأمهات وممارساتهن والنتائج الأنثروبومترية لأطفالهن دون سن الخامسة. **أدوات وطرق الدراسة:** تكونت عينة الدراسة من 314 أمًا لديهن 314 طفلًا دون سن الخامسة. تم استخدام عينة عمدية في الدراسة. تم استخدام تصميم شبه تجريبي في هذه الدراسة في عيادات الأطفال الخارجية وقسم الأطفال الداخلي بمستشفى الغردقة بمحافظة البحر الأحمر، مصر. تم جمع البيانات باستخدام ثلاث أدوات: استبيان المعرفة الغذائية، أداة تقييم الممارسات المصرح بها من قبل الأمهات، ومؤشرات القياسات الأنثروبومترية للأطفال دون سن الخامسة. **النتائج:** أظهرت 9.6% من الأمهات لديهن معرفة غذائية جيدة قبل تنفيذ البرنامج. وزادت هذه النسبة إلى 32.5% بعد تنفيذ البرنامج، . كما اظهرت النتائج قبل البرنامج، ان حوالي خمسي الأمهات ممارساتهن الغذائية غير كافية. في المقابل، بعد البرنامج الغذائي، أظهرت الدراسة أن الممارسات الغذائية لجميع الأمهات تقريبًا ذات كفاءة. فيما يتعلق بالنتائج الأنثروبومترية للأطفال، أظهرت النتائج علاقة ذات دلالة إحصائية بين طول الطفل بالنسبة للعمر، والوزن بالنسبة للعمر، ومؤشر كتلة الجسم بالنسبة للعمر، قبل وبعد تنفيذ البرنامج. **الخلاصة:** البرنامج التعليمي يؤثر بشكل كبير على المعرفة والممارسات الغذائية للأمهات فيما يتعلق بأطفالهن، علاوة على ذلك، تأثر طول الأطفال بالنسبة للعمر، والوزن بالنسبة للعمر، ومؤشر كتلة الجسم بالنسبة للعمر بشكل إيجابي بالبرنامج الغذائي. **التوصية:** تنفيذ برنامج غذائي للأمهات حول تغذية الأطفال في مختلف الأعمار وفي بيئات سريرية مختلفة لتعزيز الفوائد الشاملة. وتشجيع الأمهات على تقييم القياسات الأنثروبومترية لأطفالهن بانتظام لتعزيز النمو البدني لأطفالهن.

الكلمات المرشدة: معرفة الأمهات، ممارسات الأمهات، النتائج الأنثروبومترية، الأطفال دون سن الخامسة، برنامج غذائي.