

## Effect of Coaching Program on Mothers' Knowledge Regarding Micronutrients and Their Children's Development Under Five Years

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### Abstract

**Background:** Micronutrient deficiency is one of the major problems commonly seen in children below 5 years of age. **Aim:** to determine the effect of a coaching program on mothers' knowledge regarding micronutrients and their children's development under five years. **Design:** a quasi-experimental design (pre/post-test). **Setting:** The study was conducted at Pediatric Outpatient Clinic at Sohag University Hospital and Dar El Salama Abdallah Maternal and child health center in Sohag City. **Subjects:** convenience sampling technique consisted of 100 mothers and their children from the above-mentioned setting recruited in this study. **Tools:** Three tools were used for data collection: Tool I: Structured interview questionnaire; Tool II: Bayley Scales of Infant and Toddler Development; Tool III: Brief Infant Toddler Socio-Emotional Assessment sheet, Tool IV: Children blood test assessment sheet. **Results:** The study result revealed that (80%) of mothers possessed unsatisfactory knowledge levels regarding micronutrients. The analysis showed that there is no association between the level of knowledge of mothers regarding micronutrients with their selected demographic variables. Pre coaching program there were no statistically significant differences between mothers related to their level of knowledge about micronutrients ( $p > 0.05$ ). While there were significant differences in post-knowledge scores regarding micronutrients pre and post-coaching program ( $p < 0.001$ ). There was a significant improvement in children's socioemotional development. **Conclusion:** A coaching program regarding micronutrients had a positive effect on mothers' knowledge regarding micronutrients and their children's development under five years. **Recommendations:** Continuous application of the coaching program for mothers of children under five years to improve their knowledge regarding micronutrients which reflected positively on their children's development.

**Keywords:** Coaching Program, Children under five years, Mothers' knowledge, Micronutrients.

### Introduction

Early childhood development establishes the groundwork for future learning throughout life and is linked to health, educational attainment, and economic potential, as well as having implications for the individual, family, and society levels. Over 250 million young children are thought to be underdeveloped in low- and middle-income countries (LMICs), mostly as a result of

undernutrition and a lack of early learning opportunities, endangering their long-term growth and development (**Black et al., 2017**).

Micronutrients are vitamins and minerals that the body needs in extremely small amounts. However, they have a crucial impact on a body's health, and a lack of any one of them can result in serious, even life-threatening,

disorders. They serve a variety of purposes, including assisting the body in producing the hormones, enzymes, and other elements necessary for healthy growth and development. The most prevalent deficiencies worldwide, particularly in children and pregnant women, are those in iron, vitamin A, and iodine. The burden of micronutrient deficiencies is disproportionately felt in low- and middle-income countries (Prado et al., 2019).

Micronutrient deficiency is one of the major problems commonly seen in children below 5 years of age. Child survival is a very sensitive indicator of population, growth, and socio-economic development. Every year about 26 million children are born in our country<sup>1</sup>. Micronutrient deficiency is hidden hunger which is mostly affecting under five children. Mothers' knowledge regarding the importance of micronutrients among under-five children is the main measure to control its severity (Perumal, et al., 2018).

Children require nurturing care to support early development, including health, nutrition, safety, and security, and chances for early learning in the context of responsive carers and a stable family (Britto et al., 2017). Dendritic branching, synapse maturation, function, and myelination are all aspects of healthy brain development that are reliant on appropriate nutrition, which includes a variety of micronutrients (Stevens et al., 2022). With the incidence of maternal and child micronutrient deficiencies ranging from an estimated 9% for zinc deficiency to 20% for iron deficiency, over half of young children worldwide are deficient in at least one micronutrient (GBD, 2020).

According to Perez-Escamilla et al. (2002), responsive caring is a culturally adaptable feeding method that promotes kids to eat on their own and in response to their physical and developmental requirements. This helps kids acquire self-regulation. Early learning in a responsive and nurturing environment is a component of responsive caregiving interventions that are applied to play

and have a favorable impact on children's cognitive, language, psychosocial, and motor development (Perumal, et al., 2018). To support early childhood development, integrating nutrition and responsive caregiving treatments may be an effective use of resources. With few investigations of synergistic effects, meta-analyses and systematic reviews of combined interventions have demonstrated specificity, with positive effects on nutrition attributable to nutrition components and positive effects on development attributable to psychosocial components (Prado et al., 2019). An exceptional opportunity to examine the effects of combining nutrition and responsive caregiving treatments is available in Guatemala. The highest in Latin America and one of the highest rates of undernourishment are seen in Guatemala. With greater rates in rural and indigenous populations, stunting affects more than 45% of children under the age of five, reflecting inequality and poverty (Ministerio de Salud Pública y Asistencia Social, 2017).

Programs for nutrition education can improve mothers' understanding of how to properly care for infants and toddlers (Muluye et al., 2020). To aid the community, particularly mothers, in preventing stunting, many health professionals provide nutrition education (Black et al., 2020). Malnutrition can be impacted by nutritional imbalance during pregnancy, and bodily failure symptoms brought on by chronic malnutrition can affect newborns and toddlers (Raiten & Bremer, 2020). The mother's diet, particularly during pregnancy, has a significant impact on the nutritional intake of the child (Nurritzka et al., 2020).

Numerous studies have demonstrated that nutrition education can increase mothers' understanding of how to minimize micronutrient problems. According to research conducted in Pakistan, women who use micronutrient diagnostic applications to administer nutritional education are better equipped to identify micronutrient difficulties and instruct parents on how to prevent serious micronutrient complications in kids (Ponum et al., 2020). To decrease micronutrient problems

in children under the age of five, a study conducted in Bangladesh urged mothers to heed the advice of community health workers regarding optimal nutrition (**Mistry et al., 2019**). According to research done in Semarang, Indonesia, mothers' understanding of micronutrients has increased as a result of mobile-based nutrition education (Setyawati & Kurniadi, 2019). There is a link between nutrition education and improved maternal knowledge of toddler micronutrient problems. The incidence of micronutrient problems is reduced when nutrition education is given to pregnant women (**Abebe et al., 2016**).

Mothers are crucial in family affairs since they raise the majority of the children (**Sopiatun & Maryati, 2020**). To aid in the growth and development of infants and children and to prevent numerous disorders, moms must have adequate nutrition (**Dhami et al., 2019**).

#### **Significance of the study:**

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Multiple micronutrient supplementation helps raise serum micronutrient levels and lower anemia rates (**Black & Aboud, 2019**), but its impacts on a child's development have not been well investigated. Responding promptly, age-appropriately, and delicately to children's behavior is referred to as responsive caring. Positive interactions between carers and children reinforce one another and encourage future interactions, fostering attachment and self-control (**Landry et al., 2021**).

Micronutrient deficiency can result in clinically less significant declines in overall capacity, mental clarity, and energy levels in addition to apparent and potentially dangerous health issues. This may result in poorer academic performance, decreased productivity at work, and a higher chance of contracting other illnesses and medical disorders. Numerous of these deficiencies can be avoided by learning about nutrition, eating a balanced diet rich in a variety of foods, and supplementing when necessary. In recent decades, these programs have achieved

significant progress in lowering micronutrient deficiencies, but more work needs to be done.

Coaching is one of the few options accessible to aid in the development of conscious professional development. Learners, recent graduates, and working nurses will benefit from this. People who desire to reach their full potential, establish goals and means to achieve them, as well as increase their knowledge and skill, can use this strategy as a type of support. Coaching enables nurses to enhance their existing knowledge and acquire new abilities. According to the **International Coach Federation (2018)**, the environment that coaches create helps learners grow their knowledge and abilities.

#### **Aim of the study:**

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The study aimed to determine the effect of coaching programs on mothers' knowledge regarding micronutrients and their children's development under five years through:

- Assessing knowledge level regarding micronutrients among mothers of children under five years pre and post-coaching program.
- Assessing children's development under five years pre and post-coaching program.
- Designing and implementing coaching programs based on the mothers and their children's needs.
- Assessing the association between the levels of knowledge regarding micronutrients among mothers of children under five years with their selected demographic variables.
- Evaluating the effect of coaching programs regarding micronutrients on mothers' knowledge and their children's development.

#### **Research hypothesis:**

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Post-coaching programs regarding micronutrients expected will have a positive effect on improving mothers' knowledge and their children's development under five years.

#### **Subjects and Method:**

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**Research design:**

A quasi-experimental research design was used in this study (pre/post-test).

**Setting:**

The research was carried out at Pediatric Outpatient Clinic at Sohag University Hospital and Dar El Salama Abdallah Maternal and Child Health Center at Sohag City. This setting was selected because of the high prevalence of children in this setting, as well as the fact that it serves the most populated region of the country.

**Subjects:**

The convenience sampling technique consisted of 100 mothers and their children from the above-mentioned setting recruited in this study

**Data collection tools:**

Four tools were used for data collection:

Two tools were used to collect data and carry out the present study.

**Tool (I):** Structured interview questionnaire: It was designed by the researcher after reviewing related literature (Jeong et al., 2021; Zhang et al., 2021; Pérez-Escamilla et al., 2021), it consisted of four parts as the following:

**Part (1): Included demographic characteristics of the mothers and their children:** It included 3 open-ended questions:

- Demographic characteristics of the child, such as age, gender, and child ranking.
- Demographic characteristics of mothers regarding age, educational level, and occupation.

**Part (2): Children's medical history:**

It included items related medical history of children such as the effect of the disease on general health and the presence of complications of the disease.

**Part (3): Mothers' knowledge about micronutrients:**

It consisted of 10 questions divided into two sections: the first section asked six questions concerning the mothers' knowledge of micronutrient conditions, including definition, importance, risk factors, causes, symptoms and signs, and complications. The second section

included three questions about their role in caring for children with micronutrient deficiency, prevention of complications from micronutrient deficiency, adequate nutrition for children with micronutrient deficiency, and prevention of micronutrient deficiency.

**Scoring system of knowledge:**

The overall score for knowledge was 13 points; questions were either correct or incorrect, with one point awarded for correct answers and zero for incorrect answers and I don't know. Mothers' knowledge was divided into three categories: poor knowledge (> 50% of total score), fair knowledge (50 % to 70% of total score), and good knowledge (greater than 70%) (Tam et al., 2020).

**Tool (II):** Bayley Scales of Infant and Toddler Development

The Bayley Scales of Baby Development (BSID), which were created and standardized in English, are still one of the most popular methods for gauging baby and toddler development. The third version of the BSID (BSID-III) features distinct scales for cognition and language, allowing for a more thorough analysis of the effects of providing an English-based test on non-English-speaking children's cognitive and language scores. NRN-certified examiners used the BSID-III cognitive and linguistic scales to evaluate each child. A bilingual examiner or a certified examiner with an interpreter translated and administered the BSIDIII in Spanish for kids whose major language was determined to be Spanish. A parent-reported questionnaire called the Brief Infant Toddler Social Emotional Assessment (BITSEA) is used to evaluate social/emotional problems in kids between the ages of 12 and 36 months. 49 items on the problem scale and 11 items on the competence scale are rated individually by parents on a Likert scale from 0 to 2. Measures on the scales cover attention, compliance, dysregulation, maladaptive habits, anxieties, externalizing behaviors (activity, aggression), internalizing behaviors (inhibition, sadness), and dysregulation (issues sleeping, eating). The issue and competency scales yield

a standard score. Although standardization was done with English-speaking parents and their kids, like with the BSID, the BITSEA questionnaire was translated into Spanish.

The third edition of the Bayley Scales of Infant and Toddler Development (Bayley-III) is a self-administered questionnaire that evaluates five critical developmental areas in infants and toddlers between the ages of one and forty-two months: cognition, language (receptive and expressive communication), motor (gross and fine), social-emotional development, and adaptive behavior. While the last two are evaluated using questionnaires that must be filled out by the primary carer, the first three are evaluated by direct observation of the kid in test circumstances. The last two scales are less frequently employed in clinical and research contexts because they are seen as complementary. The Bayley-III motor scale evaluates both fine motor control and axial motor skills, including sitting, standing, and walking. The language scale evaluates two major aspects of language, receptive and expressive communication skills, including a child's ability to recognize sounds and receptive vocabulary; the expressive communication subtest evaluates preverbal communication, vocabulary use, and morpho-syntactic development (Bayley, 2006). Its cognition scale evaluates the child's performance in several areas, such as visualization, memory, and attention. There is no overall total score provided by Bayley-III; instead, each domain's raw and scaled scores, as well as the composite scores and percentile rankings for each scale, are provided separately. Based on the population of Americans, the child's development is categorized at the end of the process into one of seven levels (very low, borderline, low average, average, high average, superior, or very superior) (Bayley, 2006). In the US, 1,700 kids between the ages of 16 days and 43 months and 15 days were used to gather Bayley-III normative data in 2004. The reliability coefficients for the Bayley-III subtests for fine motor, receptive communication, and cognitive abilities are .86, .87, and .91 respectively (Bayley, 2006).

### **Tool III: Brief Infant Toddler Socio-Emotional Assessment sheet:**

The Brief Infant-Toddler Social and Emotional Assessment (BITSEA) is a norm-referenced, standardized tool used to evaluate social-emotional competence and difficulties in children between the ages of 12 and 35 months 30 days. A shorter version of the larger ITSEA, the BITSEA is intended to be used primarily in early intervention settings (Briggs-Gowan and Carter, 2007). It can be applied as a first- or second-stage screening method to find kids who might need a more thorough evaluation or referral. The BITSEA measures the same areas as the ITSEA, however, it is typically employed in circumstances where there is a lack of time or resources that precludes the use of longer instruments like the ITSEA. The BITSEA includes items that assess competence as well as issues with externalizing, internalizing, dysregulating, maladaptive, and atypical behavior. The Problems scale and the Competencies scale are two scales that come together to make up the measurement.

### **Structure:**

Two forms are part of the BITSEA: one is for parents, and the other is for childcare providers. 42 elements were taken from ITSEA questions and are included on both the Parent Form and Childcare Provider Form. The respondent assigns a three-point rating to each statement (0 = not true/rarely, 1 = somewhat true/occasionally, and 2 = very true/always). A respondent has the option of responding "N" for some things, which stands for "no opportunity". The measure can be finished in about 5-7 minutes by a parent or carer alone, or in 7-10 minutes as part of a structured interview. When completing a self-administered questionnaire, each parent must complete it independently.

### **Scoring and Interpretation:**

The tool can be used as a structured interview but is typically used as a self-administered tool. The BITSEA may be scored manually by adhering to the guidelines provided in the examiner's manual. The Problem and Competence Total scores are

easily obtained by summing up the response ratings for each Problem and Competence question, then comparing them to the cut scores listed in the manual. The Childcare Provider forms do not have their unique independent norms, but both the Parent and Childcare Provider forms are assessed in the same way. Infants who were born preterm have their scores calculated with special care. On Problems scales, a percentile rank of 25 or higher is referred to as a "possible problem" in the Examiner's Manual. Similarly, "possible deficit/delay range" refers to percentile ranks of 15 or lower on the Competence scale. The possibility of a problem or delay identified by the BITSEA is emphasized, and it is always necessary to follow up. A portion of the examiner's manual is devoted to scoring interpretation and contains instructions for doing so.

#### **Subscales:**

Both social-emotional disorders and social-emotional abilities are measured by the BITSEA's items. The 31 items on the Problem scale address issues like externalizing problems (such as excessive activity, hostility, and defiance), internalizing problems (such as anxiety and depression), dysregulation issues (such as negative emotionality, eating, and sleeping issues), maladaptive behaviors, and atypical behaviors. The measure's Competence scale consists of 11 items that address socio-emotional qualities such as empathy, compliance, prosocial peer relationships, mastery motivation, sustained attention, compliance, and social relatedness.

**Tool IV:** Children's blood test assessment sheet; it was used to measure HB and serum ferritin concentration.

#### **Procedures:**

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Three stages of this study's execution were used:

##### **Preparatory phase:**

Utilizing books, papers, the internet, newspapers, and magazines to construct data-

gathering tools required analyzing pertinent historical and contemporary information as well as theoretical comprehension of numerous study-related concerns. The researchers began by conducting 20 to 30-minute-long individual interviews with each mother before the coaching program was implemented.

##### **Validity of the tools:**

Clarity, thoroughness, appropriateness, and relevance were checked for in the content of the tools. Five knowledgeable professors with more than ten years of experience, including two professors of pediatric nursing and two professors of community health nursing, reviewed and edited the tools' content validity to make sure the questionnaire was understandable and pertinent. Despite the panel's recommendation, no adjustments were made. CVI = 89%, according to the analysis of the content validity index (CVI).

##### **Reliability of the tools:**

Using Cronbach's Alpha, the tools' reliability was evaluated. The results for tool (I) were 0.899, tool (II) was 0.775, tool (II) was 0.704, and tool (II) was 0.915.

##### **Pilot Study:**

10% of the sample research (10 mothers and their children) were used in a pilot study to assess the tools' clarity, feasibility, application, and time requirements for filling them out. Participants in the pilot study who were mothers were enrolled in the full research.

##### **Administrative Design:**

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An official letter requesting permission to conduct the study was directed from the dean of the faculty of nursing at Sohag University to the directors of the previously selected setting to obtain their approval to carry out this study.

##### **Ethical consideration:**

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To conduct the study, official letters were acquired. Official administrative approval from those in charge of the setting was obtained

before this study could begin. To tell the mothers and their children about the research and request their written approval to participate in the study, a letter was sent to them after getting the written permission. All participants were informed of the study's purpose at the outset, which gave them comfort that all data collected would be kept private. The study's purpose and advantages were described by the researchers to the mothers and their children. The mothers were informed that their children's involvement was voluntary and that they had the moral freedom to accept or reject the study. They were also given the option to leave the study at any moment without providing a reason, and it was again stressed that their responses were kept confidential. Every step of the data collection process was done with a commitment to privacy and confidentiality. In the letters given to the moms of the children, all ethical issues were explained.

### Implementation phase:

Data were gathered from the first of July 2023 to the first of December 2023. The researcher greeted and introduced herself to the mothers and went over the goals of the study with those who agreed to participate for two days each week from 9 am to 12 pm before any data was gathered.

When applying to a coaching program: Here, researchers use the GROW modeling approach (Whitmore, 2002). The GROW model of coaching strategy—Goal, Reality, Options, and Will—is the most widely used. The GROW employs a collaborative problem-solving process that includes identifying the issue's root cause, developing a solution, and putting it into action. It focuses on the actions coaches do to help clients achieve their goals and deal with problems during the coaching process. There are four stages:

1. G for Goal: The goal, which should be as clearly defined as possible, is the participants' intended outcome.
2. R for Reality asks participants to describe their current situation and the distance they currently stand from their goals.
3. O for obstacles and options: What obstacles

(barriers) prevent participants from achieving the goal? Once these barriers have been recognized, the helper can look for alternatives and suggestions.

4. W for the willingness to move forward: Once possibilities have been decided upon, they must be converted into steps that nurses may do to accomplish the goal.

5. Throughout the intervention, all participants took part in the coaching program, which had 4 sessions and included both group talks and one-on-one or telephone coaching sessions. The training was given to the participant group using the GROW coaching paradigm.

In phase G (goal setting), before the start of instruction on a given subject, the researchers defined and confirmed specific goals the subjects wished to accomplish in each subject, including the definition, significance, risk factors, causes, symptoms, indicators, and problems. Three questions about their responsibilities in providing for children with micronutrient deficiencies were added in the second half of the survey: ones about problems, proper nutrition, and prevention of micronutrient deficit.

The researchers employed framing questions in the R (Reality) stage to determine the difficulties and impediments to applying the topic of "care guidelines for children with micronutrient deficiency."

By detailing what participants had to understand and do for each program issue, the researchers promoted learning throughout the O (options) stage. Additionally, they arrange coaching sessions depending on participant requirements and the most recent guidelines for raising kids who are micronutrient deficient.

The researchers affirmed the data in the last W (will) step and recommended participants boldly use coaching in their jobs. Throughout the coaching process, the coach does not provide pre-written responses. As the participant works through the process, the coach offers assistance by listening carefully to what they have to say and by asking open-ended questions that are designed to help them

come up with the optimal strategy for attaining the defined aim in light of their resources.

The subject contents have been sequenced through 4. **The first lecture** covered an overview of micronutrients including definition, importance, risk factors, causes, symptoms, signs, and complications. **The second and third lectures** focused on the role in caring for children with micronutrients: Prevention of complications, and adequate nutrition. The follow-up and prevention of micronutrient deficiency were covered in **the fourth lecture**. To provide the mothers with comprehensive information about micronutrients, a condensed booklet was employed as a helpful resource and distributed in Arabic.

Haemoglobin and serum ferritin concentrations were measured in blood samples to decide. Venipuncture was used to get blood, which was then drawn into a container. All of the children had blood drawn by a skilled lab professional. These tests were all carried out in a private medical analysis facility. Hemoglobin levels below 11.5% were used to define anemia. The following criteria were used to categorize the severity of iron deficiency anemia: iron depletion was defined as a serum ferritin concentration below 12 g/L, and iron deficiency anemia as a serum ferritin value over 12 g/L. The World Health Organization's definitions of anemia, iron depletion, iron deficiency, and iron deficiency anemia (WHO, 2001) were used.

#### **Evaluation phase:**

Following the coaching program sessions, the researchers begin to evaluate the training and determine the effect of the coaching program on mothers' knowledge regarding micronutrients and their children's development under five years using the same pre-test tools.

#### **Statistical analysis:**

Computers were utilized to edit, code, and enter the data that were obtained from the PC that was used to analyze the sample. For computerized data entry and statistical analysis,

the Statistical Package for Social Sciences (SPSS) version 22 was used. Data were presented using descriptive statistics using frequencies, percentages, and Mean SD. A correlation coefficient, sometimes called a "Pearson correlation," is a metric used to indicate different kinds of linkages or a statistical relationship between two variables. The level of significance for statistical analysis was set at P 0.05. The Chi-Square test statistic is often used for investigating correlations between categorical data.

#### **Results:**

**Table 1** shows the children's demographic data. Regarding age, 42% of them were between the ages of 2 - < and 5, with a Mean of  $4.56 \pm 1.33$ , and 56% of them were boys. Concerning child ranking, 40 % of the children were ranked second.

**Table (2):** Illustrates that micronutrient deficiency affected 60% of the general health of children. Concerning **the presence of complications of the disease**, 15% of children had complications from the disease.

**Table (3):** Reveals that 67% of the studied mothers aged between 18 < and 30 years with a mean of  $27.44 \pm 5.22$  and 48% of them had secondary education. Meanwhile, it is pointed out that 64% of the mothers were housewives, and 60% of them were living in rural areas.

**Figure (1):** Shows that the main source of knowledge regarding the micronutrients of the studied mothers was doctors.

**Table (4)** depicts that mothers' knowledge has improved significantly regarding micronutrient **pre and post-coaching programs** ( $P < 0.001$ ).

**Figure 2:** Presents that 80% of the studied mothers had poor knowledge levels regarding micronutrient pre-coaching programs while almost of them (98%) had good knowledge of post-coaching programs with significant improvement at  $< 0.001$ .

**Table (5)** depicts that **children's development** has improved significantly after their mothers received a **coaching program** about micronutrients with statistically significant **differences**.

**Table (6)** depicts that children's hemoglobin and ferritin improved significantly after their



mothers received a coaching program about micronutrients with statistically significant differences ( $P < 0.001$ ).

**Table (7):** This table shows that there was a significant association between

the mothers' level of knowledge scores in pre and post-educational intervention and their demographic variables.

**Table (1):** Frequency and percentage distribution of the studied children regarding their demographic data (n=100)

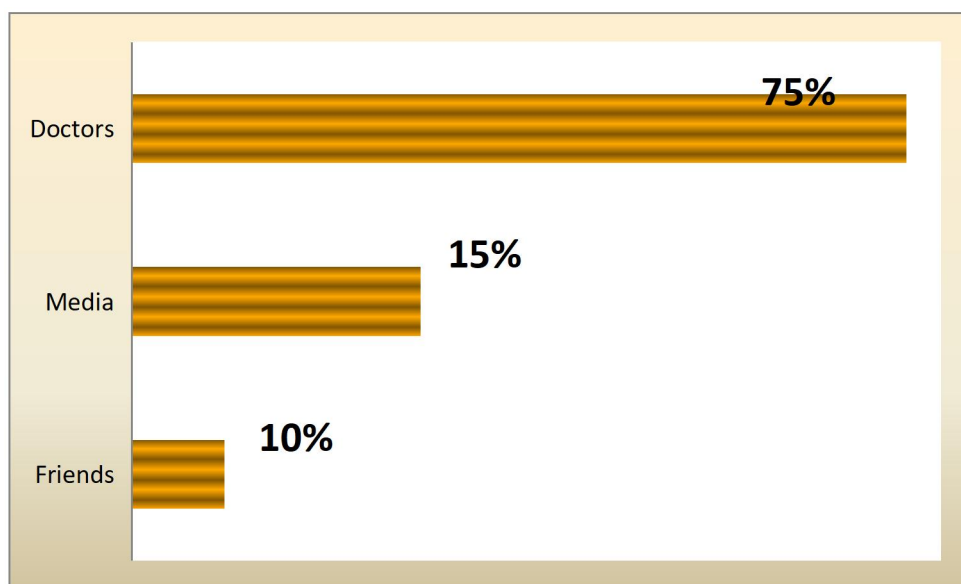
Demographic data	No	%
<b>Age: (years)</b>		
<2	24	24%
2 - < 5	42	42%
> 5 years	34	34%
Mean $\pm$ SD	4.56 $\pm$ 1.33	
<b>Gender:</b>		
Boys	56	56%
Girls	44	44%
<b>Child ranking:</b>		
First	26	26%
Second	40	40%
Third or more	34	34%

**Table (2):** Frequency and percentage distribution of the children with PKU regarding the medical history (n=100)

Medical history	No.	%
<b>Effect of the Disease on general health</b>		
Yes	60	60%
No	40	40%
<b>Presence of complications of the disease</b>		
Yes	15	15%
No	85	85%

**Table (3): Frequency and percentage distribution of the studied mothers regarding their demographic data (n=100)**

Demographic data	No.	%
<b>Age in years</b>		
18 < 30	67	67%
30 – 40	33	33%
<b>Mean ±Stander deviation</b>	27.44 ± 5.22	
<b>Educational level</b>		
- Read and write	22	22%
-Secondary education	48	48%
-University education	30	30%
<b>Occupation</b>		
Working	36	36%
Housewives	64	64%
<b>Residence</b>		
Urban	40	40%
Rural	60	60%

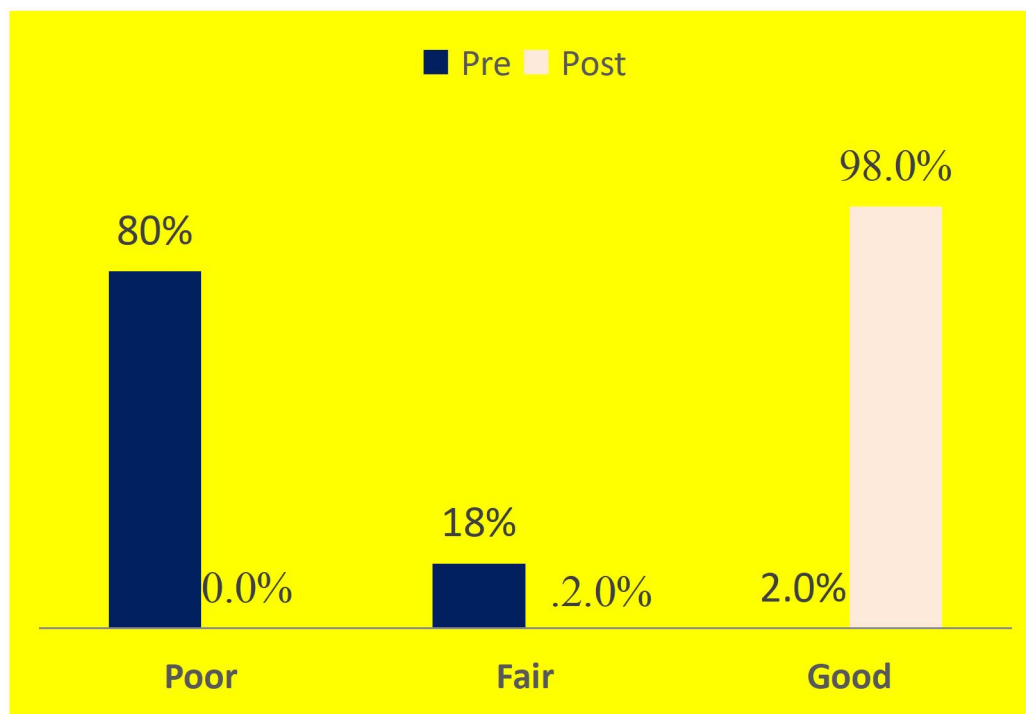


**Figure (1): Percentage distribution of the studied mothers regarding their source of knowledge about micronutrients (n=100)**

**Table (4): Percentage distribution of the studied mother's knowledge regarding micronutrient pre and post-coaching program (n=100)**

Mother's knowledge	No =(100)		P-value
	Pre-coaching program	Post-coaching program	
	(%)	(%)	
Micronutrient definition	20%	94%	<0.001*
Micronutrient risk factor	30%	86%	<0.001*
Micronutrient causes	16%	82%	<0.001*
Micronutrient symptoms	32%	80%	<0.001*
Micronutrient complications	28%	86%	<0.001*
Role in caring for children with micronutrient deficiency	24%	90%	<0.001*
Prevention of complications from micronutrient deficiency	36%	88%	<0.001*
Adequate nutrition for children with micronutrient deficiency	38%	88%	<0.001*

\*\* Highly Statistically significant ( $P \leq 0.001$ )



**Figure(2): Percentage Distribution of Total Knowledge Level regarding micronutrients among the Studied mothers' pre and post-coaching program (n= 100).**

**Table (5): Differences in mean score among the studied children regarding their child development pre and post-coaching program**

Child development	Pre-coaching program	Post-coaching program	Pre-coaching program vs. Post-coaching program
	(n = 100)	(n = 100)	(95% CI) <sup>c</sup>
Cognitive score	92.51 (11.74) 88.79 (9.7)	93.63 (11.86) 88.76 (9.8)	-0.59 (-2.88, 1.7)
Language score	84.05 (15.42) 82.66 (11.7)	85.08 (15.17) 82.98 (11.35)	0.06 (-2.78, 2.91)
Motor score	86.03 (11.62) 87.57 (11.59)	86.8 (12.1) 87.89 (11.3)	-0.36 (-2.87, 2.16)
Socioemotional competence	10.83 (5.84) 10.96 (6.59)	11.35 (5.81) 11.97 (6.7)	0.17 (-1.19, 1.53)
Socioemotional problems	16.97 (8.91) 9.86 (5.36)	18.15 (9.61) 11.05 (6.62)	-0.83 (-2.59, 0.93)

**Table (6): Differences in mean score among the studied children regarding their Hemoglobin and Ferritin score pre and post-coaching program**

Items	Pre-coaching program	Post-coaching program	P -value
Hemoglobin	10.77 (1.44)	10.89 (1.23)	P<0.001
Ferritin	10.3 (26.33)	12.52 (19.88)	P<0.001

**Table (7): Association between the level of knowledge of mothers regarding micronutrients with their selected demographic variables (n=100)**

Demographic Variables	Pre-test						Post-test						p-value
	Poor (n=80)		Fair (n=18)		Good (n=2)		Poor (n=0)		Fair (n=2)		Good (n=98)		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Age													
18 < 30	40	50.0	9	50.0	2	0.0	0	0.0	0	0.0	50	51.0	.007**
30 – 40	40	50.0	9	50.0	0	0.0	0	0.0	2	100.0	48	49.0	
Residence													
Rural	60	75.0	8	44.0	1	50.0	0	0.0	1	50.0	48	49.0	.022*
Urban	20	25.0	10	56.0	1	50.0	0	0.0	1	50.0	50	51.0	
Educational level:													
Read and write	20	25.0	4	22.0	0	0.0	0	0.0	0	0.0	18	18.36	.004**
Secondary education	40	50.0	5	28.0	0	0.0	0	0.0	1	50.0	20	20.40	
University education	20	25.0	9	50.0	2	0.0	0	0.0	1	50.0	60	61.24	
Occupation													
Working	20	25.0	12	67.0	2	0.0	0	0.0	1	50.0	49	50.0	0.567
Housewives	60	75.0	6	33.0	0	0.0	0	0.0	1	50.0	49	50.0	

\* P- value is statistically significant

**Discussion:**

Multiple supplementation helps micronutrient raise serum

micronutrient concentrations, lower childhood anemia rates, and promote the development of children. Given that the moms of these children may lack knowledge regarding this aspect, it is crucial to arm them

with it to support them in preserving the health, development, and growth of their offspring (Jones et al., 2019).

The current study's findings show that mothers' knowledge about micronutrients has greatly improved before and after the coaching program. According to the researchers, it showed the benefits of offering coaching programs. These findings were in line with a study by Demilew et al. (2020) who investigated the "Effect of guided counseling on nutritional status of pregnant women in West Gojjam zone" in Ethiopia and discovered that mothers' knowledge of their children's nutritional status was improved by receiving health education.

These findings are in line with a study by Yunitasari et al. (2020) titled "The effects of lecture, brainstorming, demonstration (CBD) on mother's knowledge, attitude, and behavior about stunting prevention in toddlers." which found that the health education method can have an impact on the mother's level of knowledge. Knowledge of healthcare issues and awareness of their kids' health is closely associated with increased ability. By evaluating knowledge, attitudes, and actions, nutrition education is applied to families to avoid stunting in young children. According to Davison et al. (2019) and Setia et al. (2020), family-based nutrition education affects mothers' knowledge, attitudes, and behavior in reducing nutrition disorders in toddlers.

Earlier research was done by Nurhayati et al. in (2020) on "Health education about stunting nutrition in mothers to weight stunting children aged 2-5 years." they concluded that significant findings showed that health education was effective in raising mothers' knowledge to modify maternal parenting behaviors and provide nutrition, which had a favorable effect on toddlers' body weight growth.

In their article titled "Effect of

nutrition education based on health belief model on nutritional knowledge and Dietary Practice of pregnant women in Dessie Town," Diddana et al. (2018) discovered that maternal nutritional knowledge was significantly impacted by education. According to the paper by Setia et al. (2020), the impact of providing intervention also takes the shape of knowledge, attitudes, and behavior improvement.

According the current finding, the majority of the mothers who participated in the study had low knowledge of micronutrients before the coaching program, but virtually all of them had improved their knowledge after it. This outcome illustrates the necessity for moms of young children to raise their level of awareness to protect the health of their offspring. Additionally, Riti and Lewar's (2020) study on "The impact of education on mother's knowledge for stunting prevention through moringa oleifera in kuan noel village" discovered that giving mothers access to beneficial education has an impact on their ability to learn more. In addition, the article by Yunitasari and Rahayu et al., (2020), to avoid sickness, there is an improvement in premarital couples' knowledge. Additionally, reading the MCH book has a significant impact on raising mother knowledge of interventions.

By offering balanced food, enhancing knowledge and attitudes, and offering a balanced menu for toddlers, nutrition education influences maternal behavior (Demilew et al., 2020). It has been shown that educating mothers on nutrition can effectively alleviate children's poor feeding habits (Efendy et al., 2020). A higher level of care is necessary to reap the benefits of increased understanding for moms of young infants. Health education for mothers and their children can boost self-confidence, assist mothers in managing the stress of raising children, and ultimately improve the nutritional status of the children (Permatasari et al., 2021).

The current study shows that after their mothers received coaching about micronutrients with statistically significant

changes, the development of their children significantly improved. This outcome demonstrates the value of implementing the coaching program, which catered to the needs of the women and their kids while equipping them with the knowledge they needed to manage this illness.

Similarly, Zhang et al.'s study "Supporting Child Development Through Parenting Interventions in Low- to Middle-Income Countries" found that parenting programs that promote nurturing care have been shown to have positive effects on children's cognitive, language, and motor development; effects on socioemotional development are not conclusive. The Bayley Scales of Infant Development scores did not change as a result of the intervention or at the 9-month follow-up, and neither did the iron status or anemia nor did any other developmental or growth outcomes. The iron status and developmental outcomes up to age 4 were not correlated in a systematic study of iron supplementation from 6 to 24 months (McCann et al., 2020).

This result was consistent with a study by Soof et al. (2022) titled "Effectiveness of nutritional supplementation during the first 1000-days of life to reduce child undernutrition in Pakistan," which found that children who received intervention during the first 1000 days had increased length for age Z scores at 24 months of age. According to Jeong et al. (2021), programs that prioritized responsive caregiving had better effects on parenting expertise, habits, and parent-child interactions. These outcomes were advantageous for cognitive development. Despite the positive effects of interventions on development, they often have effect sizes that are similar to those of caring alone (Dulal et al., 2021; Jeong et al., 2020).

These findings could mean that mothers who participated in micronutrient coaching programs experienced a significant improvement in their children's hemoglobin and ferritin levels. Ferritin and

hemoglobin levels rose in the treatment group, which was in line with a comprehensive analysis that discovered that these levels rose in response to certain micronutrients (Tam et al., 2020).

According to the study's findings, there was a strong correlation between the mothers' demographic characteristics and their pre-and post-educational intervention knowledge ratings. This finding can be explained by the fact that mothers in metropolitan regions, with high levels of education, and who are older had access to more information that would be helpful to them in enhancing the health of their children. Young mothers also lacked appropriate expertise.

Given where the mothers in the study lived, it may be understood that moms in rural regions had a greater lack of awareness and difficulties visiting an urban hospital or health center when a suspected problem arose. Rural locations also differ in terms of culture, values, and beliefs.

### **Conclusion:**

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According to the current study's findings, The coaching program about micronutrients had a good impact on mothers' knowledge regarding micronutrients and their children's development under five years.

### **Recommendations:**

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#### **The following recommendations are made in light of the study's findings:**

- Continuous application of the coaching program for mothers of children under five years to improve their knowledge regarding micronutrients which reflected positively on their children's development.
- Ongoing mothers' coaching program to assist them learns more about their needs to avoid micronutrient complications.
- It is crucial to educate nurses about micronutrients to take responsibility to disseminate the importance of practicing preventive measures of micronutrient deficiency.

- The same study is being replicated for data generalizability utilizing a larger probability sample in several locations.

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