World Journal of Nursing Sciences 2 (3): 153-163, 2016
ISSN 2222-1352

DOI: 10.5829/idosi.wjns.2016.153.163

Nutritional Education Intervention for Mothers with Children Having Congenital Heart Defects

[1]Magda Ahmed Abd El Aziz, [1]Boshra Attia Mohammed,
[1]Ohoud Youssef El-Sheikh and [2]Rasha A. Mohamed

[1]Department of Pediatric Nursing, Faculty of Nursing, Mansoura University, Mansoura, Egypt
[2]Department of Community Health Nursing,
Faculty of Nursing, Mansoura University, Mansoura, Egypt

Abstract: Poor nutrition is one of the common complications in children with symptomatic congenital heart defects (CHDs). Optimal nutrition for children with CHDs should be considered as early corrective interventions to be intensified. This study aimed to assess the effect of nutritional education intervention on mothers' knowledge, practices and attitude toward their children with congenital heart defects. A quasi-experimental research design was used. This study was conducted at the outpatient clinic of Mansoura University Children's Hospital (MUCH). Convenient sample of (77) mothers with their children (77 child suffering from CHDs) were participated. Four tools were used for data collection. Results: The majority of the mothers had poor level of knowledge, practices and attitude pre-implementation of the nutritional intervention. However, significant improvements were achieved in mothers' knowledge, practices and attitude post one-month and post-three months after implementation of nutritional education intervention (P=0.000). Additionally, about three-quarters of children had a cyanotic heart defects. One fifth of them (20.8%) were underweight based on BMI pre-implementation of intervention. However, it was decreased to 11.7% and 6.5% post one-month and post-three month respectively after implementation of nutritional education intervention. Conclusion: After the implementation of nutritional education intervention, there were improvements in the mothers' knowledge and practices regarding nutritional management of their children with congenital heart defects. In addition, the mothers had significant positive changes in their attitude regarding the nutritional management of their children. Recommendations: There is a need for developing nutritional standards and protocols for nutrition of CHDs to standardize the nutritional care provided to the affected children.

Key words: Children · Congenital Heart Defects · Education Intervention · Nutrition · Mothers

INTRODUCTION

Congenital heart defects (CHDs) are the problems with the heart structure that are present at birth, which may change the normal flow of blood through the heart. CHDs are the most common type of birth defects and the second cause of death in infancy and childhood [1]. These children are often diagnosed in the first year of life and childhood period. CHDs include several types of structural heart defects as; atrial septal defect (ASD), ventricular septal defect (VSD), pulmonary stenosis, aortic stenosis, coarctation of the aorta, tetralogy of fallot and transposition of the great arteries. Some defects require no treatment, but most of them need treatment and surgical correction soon after birth [2].

The surviving rate among those children was improved due to proper diagnosis and treatment. About one-third of children with CHDs required surgical intervention. So, the mortality rate has significantly decreased. But, many are left with substantial physical, intellectual, psychological and social difficulties, leading to an increased burden upon families, health care systems and educational facilities [2]. Currently, CHDs in children continue to be a global health issue worldwide [3]. According to the report on behalf of the American Heart Association and Strokes Statistics subcommittee, the

Corresponding Author: Ohoud Youssef El-Sheikh, Department of Pediatric Nursing, Faculty of Nursing, Mansoura University, Mansoura, Egypt.

incidence of CHDs ranged between 4 and 10 per 1000 live births in United States, while it is 6.9 per 1000 live births in Europe and 9.3 per 1000 live births in Asia. Globally, the incidence of congenital heart disease is 8 to 12 per 1000 live births [2]. The Egyptian children incidence is 5:6/1000 life birth [4]. Understanding health issues and needs across the lifespan are vital to improving the lives of individuals born with these conditions [3].

Despite the recent advances in medical and surgical management for children with CHDs, growth and development are often compromised. A popular view is that those children are often small and under-nourished. Inadequate nutrition and poor nutritional practices are a major threat to delay their growth and development [5].

Poor nutrition is one of the common complications in children with symptomatic CHDs, expected by anemia, low arterial oxygen saturation, heart failure and poor dietary history [6]. Most treatment strategies aim to facilitate "catch-up" growth, providing extra calories and protein that exceed the recommended dietary allowance for age. Several studies have examined height, weight and protein status. But, there has been no detailed assessment of nutrition and educational guidelines for the parents. Therefore, nutritional counseling is required to improve child nutritional practices [5].

The nurse is responsible for providing mothers with adequate knowledge and instructions about the care of their children. Nurses should give parents and their children with CHDs effective guiding about their illness and lines of management with an emphasis on program related to nutritional status and feeding problems [7]. Health care providers should give adequate time and efforts to raise the parents' awareness and education regarding how to provide the adequate management of their children and provide them with the useful advices [8]. In addition, according to Burns *et al*. [9] who stressed on having a nursing staff knowledgeable in life skills training and empowering mothers are necessary. Mothers are the primary caregivers who spend most of the time in providing both general and specialized care for children with CHDs. So, they are the role models of their children about eating behaviors [10]. The mothers need more knowledge and information about the effective ways of taking care of their children. Education is a simple, inexpensive and necessary instrument for the society's health which eventually changes the behavior to create a healthy life. In addition, it plays a critical role in health and treatment fields [11].

To our knowledge, an all-dimensional report of mothers with CHD children has not been published yet there are few studies on maternal care of children with congenital heart disease [12]. Besides, there has been no detailed assessment of nutrition and educational guidelines for the parents. Therefore, nutritional counseling is required to improve child nutritional practices [7]. Therefore, this work was undertaken to provide nutritional education intervention for mothers of children with CHDs to provide optimal nutrition.

Aim of the Study: The aim of this study was to assess the effect of nutritional education intervention on mothers' knowledge, practices and attitude towards their children with congenital heart defects through the following objectives:

- Assess mothers' knowledge, practices and attitude regarding the optimal nutritional management of congenital heart defects.
- Investigate the nutritional status of the children with congenital heart defects.
- Assess the effectiveness of nutritional education intervention on mothers' knowledge, practices and attitude regarding the optimal nutritional management of congenital heart defects.
- Assess the effectiveness of nutritional education intervention on children anthropometric measurements (BMI) and hemoglobin level.

Research Hypothesis:

- Nutritional education intervention will improve the mothers' knowledge, practices and attitude regarding the optimal nutritional management of congenital heart defects.
- Nutritional education intervention will improve the children' BMI and hemoglobin level.

SUBJECTS AND METHODS

Research Design: A quasi-experimental research design was used for this study.

Setting: The study was conducted at the outpatient clinics of Mansoura University Children's Hospital (MUCH), Mansoura city, Egypt namely; cardiology clinic is working two days a week and cardio-surgery clinic which working one day/week.

Subjects and Sampling: Convenient sample of (77)

mothers with their children (77 child suffering from CHDs) were invited to participate.

Inclusion Criteria: Mothers having children diagnosed with CHDs aged 2-18 years and willing to participate in the study.

Exclusion Criteria: Mothers having children aged less than 2 years and who refused to participate in the study.

Tools of Data Collection: The researchers designed four tools after reviewing the relevant literatures [6, 7, 8, 10, 11] as the following;

Socio-Demographic Data and Baseline Characteristics Tool (I):

Part (1): Socio-demographic characteristics questionnaire: It included information about mothers' age, level of education, occupation, residence and family income.

Part (2): Child characteristics and medical health assessment questionnaire: It included data regarding: age, sex, relevant present and past medical health history as disease history, symptoms, anthropometric measurements (weight, height, BMI) and hemoglobin level.

Assessment of Mothers' Knowledge, Reported Practices and Attitude Regarding Nutrition of CHDs

Tool (II): Mothers' knowledge structured interview sheet regarding nutrition of CHDs. It was used before and after the implementation of the nutritional education intervention to assess mothers' knowledge about nutrition of children with (CHDs). It was multiple choices questions which were classified into seven categories and composed of (33) questions. One mark awarded for each accurate response and zero (0) mark for the wrong answer or unknown answer. The method for calculating the scores will be the frequency each answer was chosen and percentages. Mean score was also calculated. The mothers' knowledge score level was categorized according to researchers' cutoff point into three categories: Poor = scores less than 50% of total scores (0- less than 16.5 marks). Fair = scores 50% to 65% of total sores (16.5- less than 21.45 marks). Good = scores more than 65% of total scores (more than 21.45 marks).

Tool III: Mothers' reported practice structured interview sheet regarding nutrition of CHDs. It was used before and after the implementation of the nutritional education intervention to assess mothers' reported practice regarding nutritional management for their children with CHDs. It included (29) statements in five categories covering: meal planning (6 items), healthy and balanced nutritional intake (10 items), preparation and preservation of food (5 items), periodic follow-up of child health condition (4 items) and practices related to nutritional problems (4 items). Each statement required a response on 3 points Likert- rating scale with 3 continua (often, occasionally and rarely); (2) for often, (1) for occasionally and (0) for rarely. Based upon scoring method utilized, the probable score was (0-58 marks). The reported practices level was done according to researchers' cutoff point and was categorized into: Proper level is ≥ 65% and improper level was < 65% of the total score.

Tool IV: Mothers' attitude interview structured sheet regarding nutrition of CHDs. It was used before and after the implementation of the nutritional education intervention. It was composed of (13) statements requiring a response on 3 points Likert- rating scale with 3 continua (agree, neutral, disagree). A scoring method was used to quantify the mothers' attitude. Each positive statement was given a score of (2) marks for agree and (1) marks for disagree, (0) mark for neutral. Negative statements were given a reversed score in SPSS as (1) was given to agree, (2) mark was given to disagree and (0) marks to neutral. The total attitudes' score was ranged from (zero to 26 marks) and was summed up for each mother. The attitude categories were done according to researchers' cutoff point and classified as follows: Positive attitude ≥ 60% of total scores (≥15.6 marks) and negative attitude <60% of total scores (<15.6 marks). Development and implementation of the nutritional education intervention.

Nutritional education intervention was designed by the researchers based on the needs assessment of the mothers' knowledge, reported practices and attitude and through reviewing the related literature.

Evaluation of the Nutritional Education Intervention: The mothers' knowledge, reported practices and attitude were evaluated pre, post one-month and post-three months of implementing the nutritional education intervention by using the same tool II, III and IV. In addition to, children' BMI and hemoglobin level were assessed.

Methods: An official letter was delivered from the dean of faculty of nursing to the director of Mansoura University Children's Hospital for permission to conduct this study after explaining and clarifying the aim of the study.

Oral informed consents were obtained from the mothers after explaining the aim of the study and ensuring confidentiality of data. The mothers were also informed about their right to withdraw from the study at any time without giving a rationale.

Review of current, local and international literature on the various aspects of nutrition of congenital heart defects was done. This review was used as a guide for developing the study tools. Tools of data collection were designed by the researchers based on reviewing the relevant literature. The tools were tested for its content validity by five experts in the field of study and tested for its reliability by using Cronbach's alpha test. The Cronbach's alpha formula was 0.90 and 0.88 for the knowledge and reported practices sheet respectively. The reliability of the attitude scale as measured by using the Cronbach's alpha formula was 0.709.

A pilot study was conducted on 10% of mothers (n= 8), who were excluded from the total subjects and were not included in the study to evaluate the clarity, applicability and reliability of the study tools and to estimate the approximate time required for data collection. Also, it helped in determining the obstacles and problems that may take place during the actual collection of data.

The mothers were interviewed by using structured interview sheets through face-to-face interviews for exploration of their knowledge, practices and attitude in relation to nutritional management of CHDs using tools I – VI. Clarification to any point of the study was provided to the mothers if needed. Each mother consumed from 30-40 minutes to fulfill the sheet, about 5-7 sheets were fulfilled\day. The researchers were available to answer questions and record the answers if needed to the mothers. For precision, the sheets were checked for completeness after each day by the researchers. All data obtained from the mothers were treated with confidentiality.

According to the obtained data from the mothers, the nutritional education intervention was designed by the researchers based on the literature review. The developed nutritional education intervention was scheduled at a time that was not conflicted with the provided care. Three (25 to 40 minutes) face-to-face group sessions in three weeks were held in the cardiac outpatient clinic at the selected hospital. Each session, the researchers explained the purpose of the session to the mothers. Numerous teaching methods and media were used as group discussion, power point presentation and colored posters. Time was set aside after each session for the group to reflect. There was also an opportunity to ask questions and review. The nutritional education intervention included Arabic brochure contained instructions intended to improve mothers' knowledge, practices and attitude regarding nutritional management of children with CHDs was distributed. It was developed by the researchers and was written in simple Arabic language with colored pictures to enhance the learning process.

After implementing the sessions of nutritional education intervention and based on the schedule of follow up for each child and communication between both researchers and mothers, the researchers distributed structured interview sheets to explore mothers' knowledge, reported practices and attitude in relation to nutritional management of CHDs using tools II–IV. Mothers' knowledge, practices and attitude were evaluated pre, post one-month and post-three months of implementation of nutritional education intervention regarding CHDs. As well, children BMI was plotted on the Center for Disease Control and Prevention chart. Accordingly, percentiles position held were identified. Body mass index (BMI) was calculated as weight (kg)/height $(m)^2$. The standard weight status categories associated with BMI for children were categorized as: underweight =<5^{th} percentile; normal weight =5^{th} to < 85^{th} percentile; overweight = 85^{th} to < 95^{th} percentile; and obese = ≥ 95^{th} percentile [13].

Analysis of hemoglobin level was done by specific kits in special laboratory at the selected hospital by the assigned technician according to hospital follow-up care. Hemoglobin reference range was determined according to Huckleberry, *et al*. [14]. BMI and hemoglobin level was measured pre, post one-month and post-three months of intervention. Collection of data and implementation of the intervention were actually carried out for seven months from the beginning of August 2015 to end of February 2016.

Ethical Considerations: An approval of ethical considerations was obtained from the Faculty of Nursing Research Ethical Committee (FNREC) / Mansoura University. Then, oral informed consents were obtained from the mothers after complete description of the purpose and process of the study by the researchers to obtain their acceptance for participation. All the mothers were informed that their participation in the study is voluntary; they have the right to withdraw from the study at any time without giving any reason. Confidentiality of the information collected and anonymity were assured for the mothers.

Statistical Analysis: Following data collection, they were coded, organized, categorized and transferred into especially design formats to be suitable for computer feeding. Statistical analyses were performed using the statistical software SPSS (Stands for Statistical Product and Service Solutions) v21. Categorical variables were described using the number and percent. Association between categorical variables was tested using the Chi-square test. Continuous variables were presented as mean±SD (standard deviation). Repeated measured analysis of variance (RM-ANOVA) was used to compare means in different follow-up duration. For all above mentioned statistical tests done, the threshold of significance was fixed at 5% level (p-value). The results were considered significant when the probability of error is less than 5% ($p < 0.05$).

RESULTS

The results of the current study were presented in the following two parts:

Part I: A- Mothers' Demographic Data and Baseline Characteristics: Table 1, reflects that the mean age of the studied mothers was 30.9 ± 6.66 years, (44.2%) of them completed a secondary degree of education, the vast majority of them (92.2%) were married, (71.4%) were living in rural areas and (80.5%) their family income was enough.

Part 1: B- Mothers' knowledge, reported practices and attitude pre, post one-month and post-three months of implementation of nutritional educational intervention for CHDs. Table 2, portrays that (1.3%) of the mothers showed good score level of knowledge with a mean of 8.6±4.58 marks during pre-implementation of nutritional educational intervention in relation to nutritional management of CHDs. However, (81.8%) of them showed good score level of knowledge with a mean of 26.6±4.32 marks and (77.9%) with a mean of 24.1±4.71 marks during post-one month and post-three months follow-up period respectively. The difference was significant ($F = 356$, $p < 0.05$) between pre, post-one month and post-three months regarding the previous item.

Fig. 1, clarifies that the vast majority (90.9%) of the studied mothers showed improper nutritional practices pre the nutritional education intervention. However, (55%) and (69%) of them showed a proper practice level during post one-month and post-three months follow-up period respectively.

Table 1: Distribution of demographic characteristics of the studied mothers

Mothers' demographic characteristics	N= (77)	%
Age/years □± SD:30.9±6.66		
≤ 20 years	4	5.2
20 ≤ 30 years	36	46.8
30 ≤ 40 years	32	41.6
40 years & more	5	6.5
Educational level		
Illiterate	10	13
Read and write	22	28.6
Secondary	34	44.2
University	11	14.3
Work status		
Working	6	7.8
Don't working	71	92.2
Marital status		
Married	71	92.2
Divorced	3	3.9
Widow	3	3.9
Residence		
Rural	55	71.4
Urban	22	28.6
Family income		
Enough	62	80.5
Not enough	15	19.5

Table 3, illustrates the mean difference between reported practices' categories as well as total reported practices before, post one-month and post-three months after the implementation of nutritional educational intervention. The results revealed significant differences between pre and post one-month and post-three months follow-up period. With respect to the total mothers' attitude, it was observed that there were statistically significant differences between mothers total attitude pre, post one- month and post-three months of implementation of nutritional education intervention regarding nutritional management of CHDs ($p< 0.05$).

Fig. 2, reveals that (59.7%) of the studied mothers showed negative attitude pre the nutritional education intervention. However, (97.4%) and (96.9%) of them showed positive attitude post one-month and post-three months follow-up period respectively.

Part II: A- Children' Demographic Data, Baseline Characteristics and Disease History: Table 4, displays that the mean age of the studied children was 7.22 ± 3.50 years old and (58.4%) of them were boys. Concerning the manifestations of disease, it was observed that (77.9%), (72.7%) and (71.4%) of them complained from fatigue, difficult feeding and arrhythmia respectively. Concerning types of congenital heart defects among the studied children, less three quadrants of them (74.03%) had a cyanotic heart disease, while (25.97%) of them had cyanotic heart disease.

Table 2: Distribution of the mothers according to their total score level of knowledge regarding nutritional management of CHDs pre, post one-month and post-three months after implementation of nutritional educational intervention

	Test time N = (77)							
	Pre		Post one-month		Post-three months			
Knowledge level	N	%	N	%	N	%	Significance	*P**
Good	1	1.3	63	81.8	60	77.9	χ^2=121.5	0.000
Fair	5	6.5	10	13	11	14.3		
Poor	71	92.2	4	5.2	6	7.8		
Total knowledge score	8.6±4.58		26.6±4.32		24.1±4.71		F= 356	0.000

χ^2:Chi-square test. F (repeated measures-ANOVA) P: Significance. * Significant ($p \leq 0.05$).
Good = more than 65% of total scores. Fair = 50 to 65% of total sores. Poor = less than 50% of total scores.

Table 3: Mean difference between reported practices categories, total reported practices and total attitude regarding nutritional management of CHDs pre, post one-month and post-three months after implementation of nutritional educational intervention

	Test time N = (77)				
	Pre	Post one-month	Post-three		
Reported practices' categories and attitude	□± SD	□± SD	□± SD	Significance	*P**
Meal planning	4.45±3.02	7.46±3.38	9.36±3.07	F = 55.77	0.000
Healthy and balanced nutritional intake	4.96±5.23	14.2±4.71	16.1±4.59	F = 138.76	0.000
Preparation and preservation of food	2.85±0.45	7.42±1.99	8.54±1.83	F = 176.67	0.000
Periodic follow-up of child health condition	2.90±2.50	4.93±2.52	6.62±2.08	F = 53.21	0.000
Practices related to nutritional problems	3.88±1.65	4.90±1.93	5.96±1.64	F = 31.13	0.000
Total mean score of reported practices	19.1±12.9	39±13.4	46.6±12.1	F = 114.14	0.000
Total mean score of attitude	15.2±3.02	24.7±3.97	23.7±3.74	F = 162.8	0.000

F (repeated measures-ANOVA) P: Significance. * Significant ($p< 0.05$)

Table 4: Distribution of the studied children' demographic characteristics, manifestations and types of CHDs

Children' demographic characteristics	N= (77)	%
Age/years □ ± SD: 7.22±3.50		
2 - ≥ 7 years	37	48.1
7 - ≥ 12 years	31	40.3
12 - 17 years	9	11.7
Sex		
Boys	45	58.4
Girls	32	41.6
Child birth order		
First	19	24.7
Second	48	62.3
Third	9	11.7
Fourth	1	1.3
Manifestations of CHDs		
Difficult breathing	53	68.8
Cyanosis	46	59.7
Arrhythmias	55	71.4
Difficult feeding	56	72.7
Fatigue	60	77.9
Edema	20	26
Types of CHDs		
A Cyanotic congenital heart disease	57	74.03
Ventricular septal defects (VSD)	33	42.85
Atrial septal defects (ASD)	9	11.68
Patent ductusarteriosus (PDA)	8	10.39
Coarctation of the aorta (CoA)	3	3.90
Pulmonary stenosis (PS)	4	5.20
yanotic congenital heart diseases	20	25.97
Tetralogy of fallot (TOF)	17	22.08
Transposition of great arteries (TGA)	1	1.30
Tricuspid atresia (TA)	2	2.60

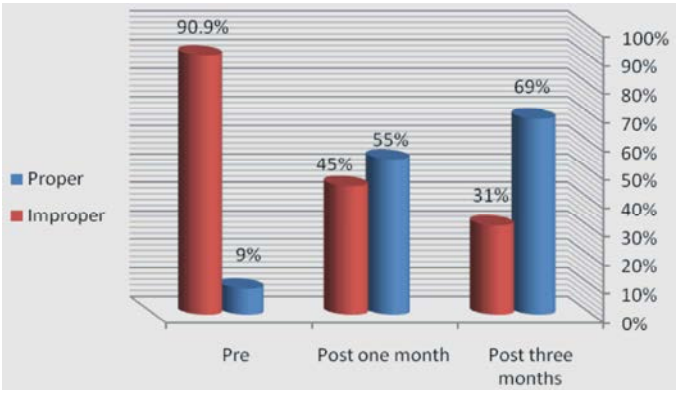

Fig. 1: Mothers' reported practices regarding nutritional management of CHDs pre, post one-month and post-three months after implementation of nutritional educational intervention

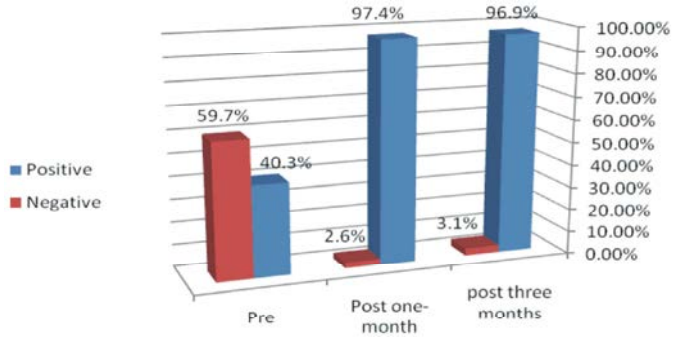

Fig. 2: Mothers' attitude regarding nutritional management of CHDs pre, post one-month and post-three months after implementation of nutritional educational intervention

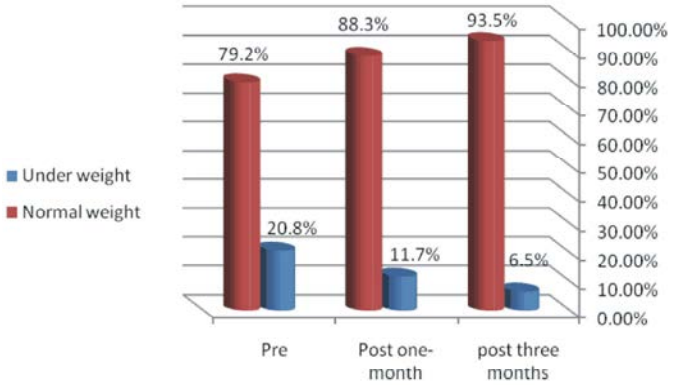

Fig. 3: Distribution of the studied children' body mass index pre, post-one month and post-three months after implementation of nutritional educational intervention

Table 5: Mean difference between children' weight, height, body mass index and hemoglobin level pre, post one-month and post-three months after implementation of nutritional educational intervention

	Test time N = (77)				
	Pre	Post-one month	Post- three months		
Variables	□ ± SD	□ ± SD	□ ± SD	Significance	*P**
Body weight/kg	21.2±7.68	21.5±7.60	22.5±7.75	F = 310	0.000
Body height/cm	113.2±15.4	113.8±15.1	115.4±15.3	F = 257.22	0.000
Total BMI	15.9±1.85	16±1.7	16.3±1.65	F = 28.58	0.000
Hemoglobin level	11.7±0.69	11.9±0.75	12.4±0.67	F = 45.85	0.000

Table 5, reflects that the mean of children' BMI was 15.9±1.85 during pre-implementation of nutritional educational intervention. However, it reached 16±1.7 and 16.3±1.65 during post one-month and post-three months follow-up period respectively. With respect to hemoglobin level, the hemoglobin level' mean was 11.7±0.69 g/dl during pre-implementation of nutritional educational intervention. However, it reached 11.9±0.75 g/dl and 12.4±0.67 g/dl during post one-month and post-three months follow-up period respectively. The difference was significant ($p< 0.05$) between pre, post-one month and post-three follow-up periods regarding the previous items.

Fig. 3, shows that (20.8%) of the studied children were underweight pre the nutritional education intervention. However, it decreased to (11.7%) and (6.5%) during post one-month and post-three months follow-up period respectively.

DISCUSSION

Congenital heart defects (CHDs) is the most common congenital malformation present at birth. At present 95% of children born with congenital heart disease survive into adulthood [15]. Different types of CHDs can affect children nutrition and growth to varying degrees. Poor nutrition is a common complication in children with symptomatic CHDs, expected by anemia, low arterial oxygen saturation, heart failure and poor dietary history. Therefore, optimal nutrition for those children should be considered. In addition, early corrective interventions should be intensified [6]. Early diagnosis of nutritional problems and nutritional supplementation intervention to restore normal growth for children are essential to CHDs child to survive [16].

Mothers are the primary caregivers for children with CHDs and the role models of their children about eating behaviors. So, the mothers need more knowledge and information to improve their practice about nutritional support for the children [11]. This study aimed to assess the effect of nutritional educational intervention on the mothers' knowledge, practices and attitude regarding nutritional management of children with congenital heart defects. This study aim is consistent with a study done by El Mahdi [16] which stressed on the importance of continuous educational programs based on the frequent assessment of parental awareness about nutritional challenges facing CHDs children. The findings of the present study portrayed that the mean age of the studied mothers was 30.9±6.66 years, (44.2%) of them completed a secondary degree of education. Furthermore, about three-quarters of them were living in rural areas and the majority of them had enough family income. These findings are more or less similar to El Mahdi, [16] who showed that 32% of mothers had secondary school level as well as 66% of them from urban areas. In addition, another study carried out by doNascimento, *et al*. [17] reported that 57.8% of the mothers had attended secondary school and the most families belonged to the lower economic classes.

The present study results illustrated that the vast majority of the mothers had a poor level of knowledge pre the implementation of nutritional education intervention. However, significant improvements were achieved post one-month and post-three months after implementation of the intervention. These might be due to using of different teaching methods and illustrated media as posters and group discussion which helped the mothers to acquire knowledge and to recall information after intervention. These results are in harmony with El Mahdi [16] who studies description of parental knowledge, attitudes and practices towards their children's congenital heart disease and its impact on their growth in Sudan heart center. He reported that about two thirds of the parents have poor knowledge about CHDs, while only (36%) of the parents had good knowledge. These study proposed that supplying outpatients clinics and inpatients departments with a multi-disciplinary team like; dietitian, social worker, a specially trained nurse and pediatrician should be inevitable to perform a plan of provisional nutritional care as well as counseling mothers about the effectiveness of nutritional support which helps their children to overcomes the nutritional complications.

As regards to mothers' reported practice, the vast majority of the studied mothers had improper nutritional practices pre-implementation of nutritional education intervention. However, significant improvement was achieved post one-month and post-three months after implementing the intervention. These outcomes supported by Edraki, *et al*. [11] who confirmed the effect of the educational program on the self-efficacy of the mothers' practices for their children with CHDs.

With respect to the mothers' attitude, there were about two-thirds of them had negative attitude pre implementation of nutritional education intervention. While, most of them had positive attitude post one-month and post-three months after implementing the nutritional intervention. The researchers' point of view suggests that the mothers were in need to gain knowledge and to modify their practices regarding optimal nutrition for their children with CHDs. Training the mothers increases their knowledge and improves their performance. This gain in

knowledge and practices can subsequently have caused changes in the mothers' attitude positively. These results supported with studies carried out by Vereecken and Maes, [18], Yabancı, *et al*. [10] which found that positive mother's attitude toward proper nutrition requirements for children are positively impact on their nutritional care provided to their children.

Regarding the children' demographic characteristics, the present study clarified that about half of them were aged from 2 to ≥ 7 years with mean of 7.22 ± 3.50 years old. More than half of them were boys and about two-thirds were the second child birth order. El Mahdi, [16] found that CHDs were presented in children mostly below 5 years of age with slight female preponderance. While, doNascimento, *et al*. [17] reported that 6.6% of studied children were ranged between 5 to 7 years old and 36.7% were 8 to 12 years, with a slight predominance of females (52.3%).

Concerning the manifestations of congenital heart defects, the result clarified that 77.9%, 72.7 % and 71.4 % of the children complained from fatigue, difficult feeding and arrhythmia respectively. These findings are supported by Monteiro *et al*. [19] and Hassan *et al*. [6] who mentioned that malnutrition is a very common problem in children with CHDs and it predicted by the presence of low hemoglobin level, low arterial oxygen saturation, heart failure and poor dietary history. As well, children with CHDs may suffer from failure to thrive and poor weight gain.

Concerning types of congenital heart defects in the studied children, about three-quarters of them had a cyanotic heart defects, whereas one-quarter had cyanotic heart defects. These results are in accordance with Bernstein, [24] and Khadim and Issa [25] who found that a cyanotic CHDs were more common than cyanotic congenital heart defects. Ventricular septal defect and tetralogy of fallot are the commonest a cyanotic and cyanotic CHDs since 1971.

Feeding difficulties and growth failure are significant issues in children with CHDs. Therefore, nutritional observation should continue after hospital discharge and at home. Moreover, establishing best nutritional practices might diminish growth failure in children with CHDs [20]. According to BMI categories, this study results showed that one fifth of the studied children were underweight pre the intervention. However, it was decreased post one-month and post-three months after implementation of intervention. These results could be attributed to the success achieved through the intervention which helped the mothers to support their children diet through needed caloric intake and consecutively increased their weight. These outcomes agree with Okoromah *et al.* [21] who mentioned that inadequate nutrition due to feeding difficulties and poor nutritional absorption is one of the multi-factorial mechanisms for growth deficiency in CHDs. Therefore, increased caloric support is required to sustain the function of myocardial and respiratory functions in CHDs.

There are many studies showed increased prevalence of malnutrition among children with CHDs as; Turkish study Tokel *et al.* [22] who reported an 85% of children with CHDs had malnutrition. In South India, Vaidyanathan *et al.* [23] reported a high prevalence of underweight (59.0%) in children with CHDs. While in Nigeria, Okoromah *et al.* [21] reported a prevalence of 90.4%. Moreover, El Mahdi, [16] concluded that children with CHDs were at risk for malnutrition. In the current study, there was a decrease in body weight, BMI and hemoglobin level pre implantation of intervention. These outcomes agree with Hassan, *et al.* [6] who concluded that malnutrition is a very common problem in children with symptomatic CHDs and were predicted by the presence of low hemoglobin level, low arterial oxygen saturation, heart failure and poor dietary history.

El Mahdi [16] stressed on the importance of establishing nutritional screening and intervention programs for helping the parents to provide their children with proper nutritional requirements. Additionally, Monteiro [19] studied nutritional status of children with congenital heart disease and concluded that it is necessary to carry out new nutritional strategies for monitoring growth and provide proper nutritional requirements that will lead to better prognosis for CHDs children. Since nurses play a critical role in educational interventions, they can improve the mothers' knowledge, practices and attitude.

CONCLUSIONS

The current study concluded that there was an improvement in mothers' nutritional knowledge and practices regarding their children with congenital heart defects. Additionally, the mothers had significant positive changes in their attitude regarding the nutritional requirements of their children after the implementation of nutritional education intervention.

Based on the findings of the present study, that the following recommendation are to be made: There is a need for developing nutritional standards and protocols for nutrition of CHDs to standardize the nutritional care provided to the affected children and to be applied at various healthcare institutions in Egypt. Further studies

are needed to screen and evaluate the nutritional status of congenital heart defects in a broadcasting number of children with CHDs. Moreover, exploration of the short and long-term impacts of nutritional intervention on morbidity and mortality of children with CHDs are needed.

REFERENCES

1. William, C. and J. Shiel, 2016. Medical Definition of Congenital heart disease. https://www.medicinenet.com
2. Mozaffarian, D., E. Benjamin, A. Go, D. Arnett, M. Blaha, M. Cushman, S. Das, S. De Ferranti, J. Després, H. Fullerton, V. Howard, M. Huffman, 2015. American heart association statistics committee and stroke statistics subcommittee. Heart disease and stroke statistics–2015 update: a report from the American Heart Association. Circulation. 131(4): e29-e322.
3. Center for Disease Control and Prevention, 2014. Data and Statistics on Congenital Heart Defectshttps://www.cdc.gov/ncbddd/heartdefects/data.html.
4. Park, M.K., 2014. Park's pediatric cardiology for practitioners. 6th edition. Philadelphia: Elsevier; pp: 676.
5. Azhar, A.S., Z.H. Al-Shammasi and R.E. Higgi, 2016. The impact of congenital heart diseases on the quality of life of patients and their families in Saudi Arabia: biological, psychological and social dimensions. Saudi Medical Journal, 37(4): 392.
6. Hassan, B.A., E.A. Albanna, S.M. Morsy, A.G. Siam, M.M. Al-Shafie, H.F. Elsaadany, H.S. Sherbiny, M. Shehab and O. Grollmuss, 2015. Nutritional status in children with un-operated congenital heart disease: an Egyptian center experience. Frontiers in pediatrics, 3: 53.
7. Togãnel, R., 2013. Nutritional Approach of Pediatric Patients Diagnosed with Congenital Heart Disease. Acta Medica Marisiensis, 59(2): 121-125.
8. Amedro, P., R. Dorka, S. Moniotte, S. Guillaumont, A. Fraisse, B. Kreitmann, B. Borm, H. Bertet, C. Barréa, C. Ovaert and T. Sluysmans, 2015. Quality of life of children with congenital heart diseases: a multicenter controlled cross-sectional study. Pediatric Cardiology, 36(8): 1588-1601.
9. Burns, T., R. Fernandez and M. Stephens, 2015. The experiences of adults who are on dialysis and waiting for a renal transplant from a deceased donor: a systematic review. JBI Database of Systematic Reviews and Implementation Reports, 13(2): 169-211.
10. Yabancı, N., I. Kısaç and S. Karakuş, 2014. The effects of mother's nutritional knowledge on attitudes and behaviors of children about nutrition. Procedia-Social and Behavioral Sciences, 116: 4477-4481.
11. Edraki, M., M. Kamali, N. Beheshtipour, H. Amoozgar, N. Zare, N. and S. Montaseri, 2014. The effect of educational program on the quality of life and self-efficacy of the mothers of the infants with congenital heart disease: a randomized controlled trial. International Journal of Community Based Nursing and Midwifery, 2(1): 51.
12. Sabzevari, S. and M. Nematollahi, 2016. The burden of care: mothers' experiences of children with congenital heart disease. International Journal of Community Based Nursing and Midwifery, 4(4): 374.
13. Centers for Disease Control and Prevention Maternal and Child Health Bureau, 2013. Assessing Child Growth Using Body Mass Index (BMI)-for-Age Growth Charts. file:///C:/Users/Win%208.1/Downloads/60MinuteBMI%20.
14. Hockenberry, M.J., D. Wilson and D.L. Wong, 2013. Wong's essentials of pediatric nursing. St. Louis, Mo: Elsevier/Mosby.
15. Dulfer, K., W. Helbing, N. Duppen and E. Utens, 2014. Associations between exercise capacity, physical activity and psychosocial functioning in children with congenital heart disease: a systematic review. European Journal of Preventive Cardiology, 21(10): 1200-1215.
16. El Mahdi, L.M., 2015. Parental knowledge, attitudes and practice towards their children' s congenital heart disease and its impact on their growth in Sudan heart center, Doctoral dissertation, University of Khartoum.
17. Do Nascimento Moraes, A., M. Terreri, M. Hilário and C. Len, 2013. Health related quality of life of children with rheumatic heart diseases: reliability of the Brazilian version of the pediatric quality of life inventory cardiac module scale. Health and Quality of Life Outcomes, 11(1): 198.
18. Vereecken, C. and L. Maes, 2010. Young children's dietary habits and associations with the mothers' nutritional knowledge and attitudes. Appetite, 54(1): 44-51.
19. Monteiro, F., T. Araujo, M. Lopes, D. Chaves, B. Beltrao and A. Costa, 2012. Nutritional status of children with congenital heart disease1. Revista Latino-Americana de Enfermagem, 20(6): 1024-32.

20. Medoff-Cooper, B. and C. Ravishankar, 2013. Nutrition and growth in congenital heart disease: a challenge in children. Current Opinion in Cardiology, 28(2): 122-129.
21. Okoromah, C.A., E.N. Ekure, F.E. Lesi, W.O. Okunowo, B.O. Tijani and J.C. Okeiyi, 2011. Prevalence, profile and predictors of malnutrition in children with congenital heart defects: a case-control observational study. Archives of Disease in Childhood, 96(4): 354-360
22. Tokel, K., E. Azak, C. Ayabakan, B. Varan, S. Aþlamacı and S. Mercan, 2010. Somatic growth after corrective surgery for congenital heart disease. Turkish Journal of Pediatrics, 52(1).
23. Vaidyanathan, B., S.B. Nair, K.R. Sundaram, U.K. Banu, K. Shivaprakasha, S.G. Rao and R.K. Kumar, 2008. Malnutrition in Children with Congenital Heart Disease (CHD): Determinants and Short-term Impact of Corrective Intervention. Indian Pediatrics, 45(7).
24. Bernstein D., 2011. Relative frequency of major congenital heart disease. Nelson's textbook of pediatrics. 19th. edition. Philadelphia: WB Saunders CO.
25. Khadim, J. and S. Issa, 2009. Spectrum of congenital heart diseases in Basra: an Echocardiography study. The Medical Journal of Basrah University, 27(1): 15-18.