

Effect of Teaching Instructions on Mother' Knowledge and Selected Outcomes among Their Children Having Permanent Pacemaker

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Abstract

Background: A pacemaker is a small device that helps heart beats more regularly; it works with a small electric stimulation. Pacemaker mainly put under the skin on chest, just under collarbone. It hooked up to the heart with tiny wires. Pacing in children is mainly performed in the cases of congenital or post-surgical complete heart block and less frequently in some surgical patients with sinus node dysfunction. **The aim of this research:** was to evaluate the effect of teaching instructions for mothers of children with permanent pacemaker on their knowledge and selected child's outcomes. **Design:** a pre-post-test quasi-experimental research design was utilized to achieve the aim of the current study. **Sample:** A convenient sample of 50 mothers of children under five years have implanted permanent pacemaker participated in the current study. **Setting:** the study was conducted at the arrhythmia out-patient clinic at the Preventive Medicine and Social Center, affiliated to Cairo University Hospitals. **Data collection tools:** were developed and collected by the researchers, it include **Structured Interview Questionnaire** to assess personal data for the child, mother and the family, **Pre – Post-test** to assess mother's knowledge about pacemaker and care for child having pacemaker, and **child's outcomes assessment sheet** to assess pacemaker complications and respiratory, cardiovascular efficiency. **Results:** the study results revealed that there were highly statistically significant difference between the means of three readings for selected child's outcomes (pacemaker complications, respiratory and cardiovascular efficiencies) and mothers' knowledge before and after receiving the instructions. **Recommendation:** Multidisciplinary team should be involved in developing, implementing and evaluating educational sessions for mothers caring children with permanent pacemaker.

Keywords: permanent pacemaker - mother's knowledge - child's outcomes.

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I. Introduction

The heart is considered the own 'natural' pacemaker in human body. It has a group of cells on the right side of the heart transmit regular electrical impulses across the two atria. The heart needs these electric signals to make it beat. Some children are born with an arrhythmia, when the heart beat is irregular, or too slow (for example bradycardia). Sometimes children may develop an arrhythmia as a result of heart surgery because the pathway along which the electric signals travel has become blocked or damaged. To maintain a steady, regular heartbeat an artificial pacemaker is implanted (University of Oxford, 2014; Children Heart Federation, 2016).

Implantation of cardiac pacemakers has been practiced for at least five decades with continuous developments of the hardware (Ashfaq, Khan, Atiq, Amanullah, & Muneer, 2017). A pacemaker is a small device that helps heart beats more regularly; it works with a small electric stimulation. Pacemaker mainly put under the skin on chest, just under collarbone. It hooked up to the heart with tiny wires. The indications, anatomical variations, and the technical skills required for pacing children are different compared to those for adults. Also, current pacemakers are smaller sized, have longer battery life, multiple programming options, therapeutic capabilities, and therefore provide greater options for pacing in children (American Heart Association, 2015).

Pacemakers may be temporary or permanent, temporary pacemakers are intended for short-term use during hospitalization. Permanent pacemakers are intended for long-term use, is recommended for certain conditions that are chronic or recurrent and not due to a transient cause. Permanent pacing may be considered necessary or appropriate for certain patients with symptomatic bradyarrhythmia or, less commonly, to help prevent or terminate tachyarrhythmia (Epstein, et al. 2015; Heart Rhythm Society (2014). The first

pacemaker was implanted for children in the late 1960s. Pediatric pacemakers comprise less than 1 % of all pacemaker implants (**Welisch, Cherlet, Crespo-Martinez & Hansky, 2014**). Applying permanent pacing therapy for children can be challenging. Many issues, such as child's size, body growth, coexistence of congenital heart disease, and presence of residual intracardiac shunts have to be considered. Selecting the best pacing system for a child requires a firm understanding of modern pacing design, pacing indications, advantages and drawbacks of pericardial and endocardial lead pacing, and possible complications (**Lofly et al., 2016**).

In an Egyptian study conducted by **Samir, Diab, Morttada, and Aboulmaaty (2015)** on 32 children undergoing permanent pacemaker implantation, the results concluded that permanent pacing in pediatric is generally safe and has a favorable long-term outcome, but there remains a high rate of complications, mainly related to leads dislodgement and infection. This is of particular concern in children who need a lifetime of pacing. They emphasized that, in pediatric pacing there are certain challenges that are not posed in adults like somatic growth, active life style, susceptibility to infection and the generally anticipated long survival. Similarly, a study held by **Czosek et al. (2016)** to evaluate utilization trends, complication rates, and cost associated with pacemaker implantation in the pediatric population. The study findings revealed that the early complications of pacemaker were pneumothorax (2.2%), hematoma (3.3%), endocarditis/pericarditis (1.1%) and surgical infection (2.4%). They emphasized that reduction in these complications would improve patient care and lower medical costs. Late complications rate in children was 37.5% of which were lead related complications or failures that necessitated re-intervention.

Special instructions should be followed while caring for children with permanent pacemakers. Strong magnetic fields will interfere with the pacemaker's ability to sense the heart's activity so magnetic resonance imaging (MRI) scanning is not allowed (unless the pacemaker is an MRI safe pacemaker). Avoid airport security systems – the child or family should show his/her pacemaker card. Mobile phones should not be placed over the pacemaker area. Avoid placing magnets over the pacemaker area as this may alter the pre-programmed pacemaker settings (**Heart Rhythm Society, 2012**). According to **American Heart Association (2015) and Vera, (2016)** nursing care for children with pacemakers involves the monitoring and prevention of common complications, preventing dislodgement, and educating parents on the proper use and maintenance of the pacemaker. Care of children with permanent pacemakers requires sophisticated knowledge and skills. The tremendous advances in pacemaker technology and complexity of modern pacing provide challenges for mothers caring for these children and their families. Knowledge of pacing physiology, components of the pacing system, indications for pacing, post-pacemaker implant care, trouble-shooting of pacemaker problems and long-term follow-up is necessary for provision of safe, effective nursing care.

As mention by **Hockenberry and Wilson (2015)**, when a pacemaker is implanted, the education of the parents and child must include simple an explanation of the device, a description of the component parts, an explanation of the surgical procedure, and discharge teaching based on the educational background. Parents should be aware of which type of lead is in place in the child. Parents teaching includes information about the signs and symptoms of infection, general wound care, and activity restrictions. The nurse should inform the family that follows up care requires routine pacemaker testing. On the same context, **the Egyptian Cardiac Rhythm Association (2016)**, documented that the child with a pacemaker should live and play.

Significance of study:

The clinical indications and scope of utility of cardiac pacemaker among children is increasing due to improved survival of children with congenital heart diseases, as well as advances in pacing technology (**Czosek et al. (2016)**). Pediatric pacemaker implants comprise less than 1 % of all pacemaker implants (**Welisch et al., 2014**). Since the first fully implanted pacemaker in October of 1960, more than 2 million people have benefit from pacemaker therapy (**Beck, Boden, Patibandla & Marine, 2015**).

According to **the statistics department at the Preventive Medicine and Social Center (2016)**, the total number of children who were connected with permanent pacemaker from less than three years and attended for follow-up in the arrhythmia clinic was about 114 children. The number of children who are under five years was 65 (57%). Through empirical observations, literature review and clinical experience in the open heart pediatric intensive care units, it was noticed that some children having permanent pacemaker, are exposed to varying sorts of complications and their mother cannot provide care for them due to lack of knowledge or fear of risk taking. Caring for children having permanent pacemakers requires knowledge about the device and its complications and home care instructions and long term follow-up. Mothers' information and knowledge is crucial and constructive in achieving appropriate post pacemaker implantation outcomes and reduction of complications during the child's life with device.

Scares research studies were conducted nationally to help mothers caring for their children with permanent pacemaker. Hence, the current study is undertaken to evaluate the impact of guidelines for mothers having children with permanent pacemaker on mother's knowledge and child's outcomes. Eventually, the results of the current study might generate an attention and motivation for further researches in the field of pediatric

cardiology. As well as providing guidance and recommendations that should be reflected in pediatric nursing education, practice and research.

Operational Definition:

Selected child's outcomes: are pacemaker complications as (arrhythmia, chest pain, dislocation, injuries, and loss of battery), respiratory efficiency as (respiratory rate, tachypnea, bradypnea, dyspnea, orthopnea , presence of cough and oxygen saturation) and cardiovascular efficiency as (pulse, tachycardia, bradycardia ,temperature, Blood pressure, capillary refill, and skin discoloration).

The aim of the study:

The aim of the current study was to evaluate the effect of teaching instructions for mothers of children with permanent pacemaker on mother's knowledge and selected child's outcomes.

Research Hypotheses:

H1: Mothers who receive the teaching instructions will have higher mean score of knowledge than before

H2: Children of the mothers who receive the teaching instructions will have better outcomes.

II. Subjects and Methods

Research design:

One group pre-posttest quasi-experimental research design, was utilized to achieve the aim of the current study. A quasi experimental design is one type of experimental design that is very similar to the true experimental design except there is lose one criteria as randomization (**Burns & Grove, 2015 & Polit & Beck, 2017**).

Setting:

The study was conducted in the arrhythmia out-patient clinic at the Preventive Medicine and Social Center, affiliated to Cairo University Hospitals. The center provides preventive, therapeutic and socials services. The center includes various out-patients clinics and arrhythmia clinic. Arrhythmia clinic located at the third floor and received children connected with pacemaker every Wednesday for follow-up. Some children were referred by physician to the pacemaker programming clinic if the child had arrhythmia at the fifth floor in Cairo University Specialized Pediatric Hospital (CUSPH).

Subjects:

A Convenient sample of 50 mothers of children under five years have implanted permanent pacemaker will be participated in the current study. The sample size was calculated based on the following formula: (International Fund for Agricultural Institution, 2015).

$$N = \frac{T^2 \times P(1-P)}{M^2}$$

Description:

N= required sample size.

T= confidence level at 95% (standard value of 1.96).

P= estimated prevalence of children under five years with permanent pacemaker (2016) is (0.57).

M= margin of error at 5% (standard value of 0.05).

Inclusion criteria

- Children under five years of age
- Children connected with permanent pacemaker for one year or less
- The mother is the main caregiver accompanied with the child
- The mother is commitment with clinic's follow up schedule

Exclusion criteria

- Children have any other congenital anomalies, or chronic illness

Data collection tools:

The required tools developed and collected by researchers after reviewing the related literature through the following tools:

1- Structured interview questionnaire: It included the following three parts to assess personal data for the child, mother and the family:

Part I: Personal data about mother as: age, level of education, occupation, number of children, place of residence, numbers of children.

Part II: Characteristics of children including age, gender, rank in the family, ability to play, appetite, elimination and activity.

Part III: History of cardiac disease of the child including diagnosis, previous operation, type of pacemaker, time of pacemaker implantation, treatment, follow up and complications.

2- Mother's Knowledge Assessment questionnaire: It included the following two parts to assess mother's knowledge about pacemaker itself and care for child having pacemaker:

Part I: mother's knowledge about pacemaker itself including: definition, functions, indications, complications, component, and support.

Part II: Mother's reported practice regarding to care for child having pacemaker including bathing, feeding, activity, accident, follow up, and treatment.

Child's Outcomes Assessment Sheet: It will include pacemaker complications as (arrhythmia, chest pain, dislocation, injuries, and loss of battery), respiratory efficiency as (respiratory rate, tachypnea, bradypnea, dyspnea, orthopnea ,presence of cough and) and cardiovascular efficiency as (pulse, tachycardia, bradycardia ,temperature, Blood pressure, capillary refill, and skin discoloration).

Scoring system:

Scoring system for **Mother's Knowledge Assessment** was 100 scores. Fifty scores were for each mother's knowledge about pacemaker itself and Mother's reported practice regarding to care for child having pacemaker, each complete answer took two scores, incomplete one took one score and the wrong answer or no response took zero. The total score will be converted to 100% (100 score), and then categorized as following: the total score less than 50% (less than 50 score) was considered as unsatisfactory while score of 50% and more (50 score) was considered as satisfactory level.

Validity and reliability:

The tools reviewing by 5 experts in pediatric nursing and pediatric cardiology to test the content validity of tools. Reliability of the tools was performed to confirm its consistency tools. The reliability coefficients' alpha between questions was 0.77.

Pilot study:

Pilot study was conducted on 5 mothers of children having permanent pacemakers to ensure the clarity of content of tools and to assess the time needed to fill the tools. Minor modifications were done such as restate some wards. Based on the results of the pilot study, mothers of children who participated in the pilot study was included in the total study sample.

Procedure:

Official permissions from the directors of Preventive Medicine and Social Center and pediatric arrhythmia out-patient clinic were obtained. Mothers who met the inclusion criteria were invited to participate in the study. The purpose and the nature of study explained to each mother individually.

An individual interview with each mother and her child were done in quiet room at clinic before entering the clinic and start to fill their personal data and characteristics of their children and Mother's Knowledge obtained by the researchers. The researchers assessed the Child's Outcomes which included pacemaker complications as (arrhythmia, chest pain, dislocation, injuries, and loss of battery), respiratory efficiency as (respiratory rate, tachypnea, bradypnea, dyspnea, orthopnea and presence of cough) and cardiovascular efficiency as (pulse, tachycardia, bradycardia ,temperature, Blood pressure, capillary refill, and skin discoloration). The interview took 30-45 mins. Data collected from February to December 2016.

The follow-up for children was done every Wednesday. Then, the researchers gave teaching instructions mothers at 2 sessions (each one have 20- 30 minutes). The first session had teaching instructions about pacemaker itself including: definition, functions, indications, complications, component, and support. The second one had teaching instructions regarding to care for child having pacemaker including bathing, feeding, activity, accident, follow up, and treatment using booklet and finally the third session were to assess Mother's Knowledge and Child's Outcomes after receiving at fourth visit at the same place. It took about 30-45 mins.

Ethical Considerations:

The oral consent obtained from the mothers of children after complete description of the purpose and the nature of the study. Children and their mothers were informed that participation in the study is voluntary. The research investigator informed the mothers about their rights to withdraw from the study at any time without giving any reason and without any effect on the care of their children. Confidentiality assured to each child and their mothers.

Statistical Analysis:

A compatible personal computer (PC) was used to store and analyze data. The Statistical Package for Social Studies (SPSS), version 11.0 was used. Data were coded and summarized using mean, standard deviation and crosstabs for quantitative variables, and percent for qualitative variables. The collected data tabulated, and

summarized. Data was computerized and analyzed using appropriate descriptive and inferential statistical tests. Qualitative data were expressed as frequency and percentage. A comparison between qualitative variables carried out by using parametric Chi square test. Comparison of means was performed using paired-sample t-test. Correlation among variables was done using Pearson correlation coefficient. Level of significance at $p < 0.05$, 0.001 were used as the cut of value for statistical significance.

III. Results

Table (1) Demographic Characteristics of Children Connected with Permanent Pacemaker. (N=50)

Items	N	%
Age (in years):		
Less than one year	37	74.00
1 - < 3	9	18.00
3 -5 years	4	8.00
Mean \pm SD	1.1 \pm 0.4	
Gender:		
Male	38	76.00
Female	12	24.00
Rank within the family:		
First	14	28.00
Middle	24	48.00
Last	12	24.00

Table (1) revealed that, about three quarters of children (74%) aged less than one year while the minority (8%) of them aged between 3-5 years old with a mean of age 1.1 ± 0.4 . Considering children's gender, more than three quarters of them (76%) was male while the rest were girls. Regarding children' rank, it was found that 48% ranked as middle child, followed by "28%" were the first child and 24% were the last child.

Table (2) Demographic Characteristics of Mothers (N=50)

	N	%
20-29	19	38.00
30-39	23	46.00
40 and more	8	16.00
Mean \pm SD	33.70 \pm 6.37	
Educational level:		
Illiterate	15	30.00
Can read and write	6	12.00
Primary school	6	12.00
Preparatory school	2	4.00
Secondary school	16	32.00
Higher education	5	10.00
Occupation:		
Working	7	14.00
House wife	43	86.00
Place of residence :		
Rural	39	78.00
Urban	11	22.00

Table (2) indicated that, more than two fifth of the mothers (46%) were aged between 30-39 years old, while the minority (16%) were more than 40 years old with a mean of age 33.70 ± 6.37 years. As regards educational level of the studied mothers it was found that less than one third of them (32%) finished secondary school and only (10%) finished higher education. Regarding occupation of the mothers, the majority (86%) were housewives and only (14%) were working outside homes. Concerning the place of residence, more than three quarters of the mothers (78%) live in rural areas while the rest live in urban areas (22%).

Table (3) Distribution of the Studied Children According to Diagnosis (n=50).

Items	No	%
Diagnosis :		
Teterology of Fallot	31	62.00
Transposition of great arteries	5	10.00
More than one	14	28.00
Number of previous hospitalization:-		
Less than 6 times	46	92.00
More than 6 times	4	8.00
Causes of previous hospitalization:		
Treatment	49	98.00
Complications	1	2.00

Table (3) showed that, less than two thirds (62%) of the children had Teterology of Fallot while 28% had more than one cardiac disorders and only 10% had Transposition of Great Arteries. In relation to the number of hospitalization the vast majority of the studied children (92%) were hospitalized more than six times and the minority (8%) hospitalized less than 6 times. Regarding causes of hospitalization most of the studied children (98%) received treatment and only 2% was hospitalized due to complications.

Table (4) Comparison between Total Mean Score of Mothers Knowledge Before and After Receiving Teaching Instructions (n=50).

Items	Before teaching instructions	After teaching instructions	t-test	P value
	Mean \pm SD	Mean \pm SD		
pacemaker (20 marks)	11.3 \pm 2.1	14.3 \pm 3.2	0.73	0.01*
Care (20 marks)	9.3 \pm 1.7	11.2 \pm 1.2	0.61	0.02*
Activity (10 marks)	6.3 \pm 2.3	7.3 \pm 3.6	0.55	0.062
Diet (20 marks)	11.3 \pm 1.4	14.2 \pm 1.2	0.88	0.02*
Follow up (10 marks)	6.3 \pm 2.1	7.3 \pm 3.2	0.9	0.07
Accident (10 marks)	4.3 \pm 1.7	7.2 \pm 1.4	0.56	0.02*
General hygienic care (10 marks)	5.3 \pm 2.1	7.3 \pm 3.2	0.93	0.01*

* Statistical significant at $P \leq 0.05$

Table (4) highlighted that, the total mean scores of mothers knowledge before getting the teaching instructions were 11.3 \pm 2.1, 9.3 \pm 1.7, 11.3 \pm 1.4, 4.3 \pm 1.7, and 5.3 \pm 2.1 respectively as regards pacemaker, care provided to their children, diet, accident prevention and general hygienic care. While, after receiving the teaching instructions the total mean scores of mothers knowledge increased to 14.3 \pm 3.2, 11.2 \pm 1.2, 14.2 \pm 1.2, 7.2 \pm 1.4, 7.3 \pm 3.2 respectively. There were statistically significant differences were detected between total mean score of mothers knowledge before and after receiving the teaching instructions in relation to pacemaker, care provided to children, diet, accident prevention and general hygienic care ($p < 0.05$).

Table (5) Comparison between Mothers Level of Knowledge before and after Teaching Instructions (n=50)

level of knowledge	Before teaching instructions		After teaching instructions		X ²	P value
	No	%	No	%		
Satisfactory	18	36	36	72	0.29	0.05*
	50.3\pm2.1		57.3\pm3.2			
Unsatisfactory	32	64	14	28	0.33	0.03*
	34.3\pm1.7		47.2\pm1.2			

* Statistical significant at $P \leq 0.05$

Table (5) indicated that, 64% of mothers had unsatisfactory level of knowledge before receiving the teaching instructions compared to 28% of mothers had unsatisfactory level of knowledge after getting the instructions. The results demonstrated that, mothers reported more satisfactory level of knowledge after receiving the instructions. There was statistically significant difference was detected between mothers' level of knowledge before and after receiving teaching instructions ($p < 0.05$). the mean±standard deviation for Satisfactory mothers knowledge's level of before receiving guidelines was 50.3 ± 2.1 , while that the mean±standard deviation for Satisfactory mothers knowledge's level of after receiving guidelines was 57.3 ± 3.2 .

Table (6) Child's outcomes before and after teaching instructions:

Child's outcomes	Before teaching instructions		After teaching instructions		X ²	P value
	No	%	No	%		
Pacemaker complications:					1.32	0.01*
- arrhythmia	18	36	11	22		
- chest pain	11	22	7	14		
- dislocation	6	12	0	0		
- injuries	19	38	10	20		
- loss of battery	20	40	11	22		0.03*
Respiratory efficiency:					1.56	0.3
- tachypnea	17	34	18	36		
- bradypnea	5	10	0	0		
- dyspnea	20	40	15	30		
- orthopnea	13	27	10	20		
- presence of cough	17	34	10	20		0.03*
Cardiovascular efficiency:					1.03	0.3
- tachycardia						
- bradycardia	13	26	9	18		
- skin discoloration	2	4	1	2		
	9	18	6	12		0.01*

* Statistical significant at $P \leq 0.05$

It was evident from table (6) that, 36%, 22% , 12%, 38 % respectively of children had arrhythmia, chest pain, dislocation, injuries and loss of battery as pacemaker complications as reported by their mothers before teaching instructions. However, pacemaker complications decreased to 22%, 14%, 0%, 20%, and 22% respectively after teaching instructions. There was highly statistically significant difference in occurrence of pacemaker complications among children before and after teaching instructions that given to the mothers. In addition, it was found that 34%, 10%, 40%, 27% and 34% respectively of children had tachypnea, bradypnea, dyspnea, orthopnea and presence of cough as respiratory efficiencies before teaching instructions , while it was 36%, 0%, 30%, 20%, and 20% in order after teaching instructions. There was highly statistically significant difference in respiratory and cardiovascular efficiencies among children as a child's outcomes before and after teaching instructions.

Table (7) the total mean score of vital signs and oxygen saturation before and after teaching instructions:

Items	Before teaching instructions	After teaching instructions	t-test	P value
	mean ± SD	mean ± SD		
- respiratory rate	34.7 ± 4.2	29.5 ± 3.2	1.56	0.00*
- oxygen saturation	90+5.3	91+6.3	0.9	0.4
- Pulse	87+9.8	83+8.3	1.03	0.00*
- temperature	37.65+1.7	37.1+1.4	2.4	0.2
- Blood pressure	83/60±15/9	80/55±13/8	0.98	0.00*
- capillary refill	3.7±1.6	3.5±1.9	1.91	0.6

* Statistical significant at $P \leq 0.05$

Table (7) highlighted that, There were statistically significant difference was detected between before and after teaching instructions mothers' general attitude regarding respiratory rate , Pulse and Blood pressure ($p < 0.05$).

Table (8) Correlation between Mother's Age and their Total Mean Score of Knowledge

Items	Age(in years)			r	P
	20-29 years (n=19)	30-39 years (n=23)	Above 40years (n=8)		
Mean ± SD before teaching instructions	3.147±0.820	3.315±0.989	1.500±0.534	0.170	0.905
Mean ± SD after teaching instructions	10.329±4.219	4.900±4.043	10.438±1.752	0.036	0.801

Table (8) revealed that, there were no statistically significant correlation between mothers' knowledge and their age, while the highest total mean score of knowledge was in age from 30-39 years old.

Table (9) Correlation between Mothers' Level of Education and their Total mean Score of Knowledge.

Mean ± SD	level of education						r	P
	Illiterate (n=15)	Read & write (n=6)	Primary school (n=6)	Preparatory school (n=2)	secondary school (n=16)	College (n=5)		
before teaching instructions	1.2±0.4	1.5±0.5	1.500±0.547	1.8±0.4	1.8±0.3	2.0±0.0	0.640	0.000**
after teaching instructions	4.2±1.	4.3±1.9	4.3±0.8	4.0±0.0	6.0±2.3	7.8±1.6	0.507	0.000**

** Correlation is significant at $P \leq 0.001$

Table (9) revealed that, there was highly statistically significant positive correlation between mothers knowledge before receiving teaching instructions $r=0.640, p=0.000$ and their level of education as well as there was a highly statistically significant positive correlation between mothers knowledge after receiving teaching instructions $r=0.507, p=0.000$ and their level of education.

Table (10) Correlation between Mothers' Place of Residence , Occupation and their Total mean Score of Knowledge.

Items Mean±SD	Place of Residence		R P	Occupation		R P
	Rural (n=39)	Urban (n=11)		Working (n=9)	Housewives (n=41)	
before teaching instructions	22.02±4.4	26.5±6.4	R=0.476 P=0.000**	22.6±5.34	25.4±1.6	R=0.311 P=0.028*
after teaching instructions	4.9±1.9	6.09±2.1	R=0.417 P=0.003**	4.9±1.9	5.6±1.5	R=0.360 P=0.010**

* Correlation is significant at $P \leq 0.05$, two-tailed.

** Correlation is significant at $P \leq 0.01$, two-tailed.

It is evident from table (10) that, there was a high statistically significant positive correlation between mothers knowledge before receiving the instructions ($r=0.476, p=0.000$) and their place of residence as well as there was a high statistically significant positive correlation between mothers knowledge after getting the instructions ($r=0.417, p=0.000$) and their place of residence, where high knowledge observed with mother live in urban areas. As well as, there was a statistically significant positive correlation between mothers knowledge before receiving teaching instructions ($r=0.311, p=0.028$) and working status as well as there was high statistically significance positive correlation between mothers knowledge after receiving the instructions ($r=0.360, p=0.010$) and their working status.

IV. Discussion

The results of the current study revealed that near three quarters of children were aged from less than one to three years while the minority of children' age was between 3-5 years old with a mean of age 2.16 ± 1.07 years. These results were supported by Farooqi, Talsania, Havmid, and Rinaldi (2015) who studied the prevalence and risk groups for implemented pacemaker among children in Mosco, and found that the percentage of implemented pacemaker among children increased significantly at age (2-4 years). On the other hand, Shawky and Sadik (2014) in a recent Egyptian study indicated that more than half of the studied children with implemented pacemaker were aged more than 5 years old. As well as Animasahun, Madise-Wobo, and Kusimo, (2017) supported the study results by concluded that the children who were implemented pacemaker, aged more than 18 months while they studied cyanotic congenital heart diseases among Nigerian children. From the researcher point of view, children who were implemented pacemaker aged from 2 to 4 years to be less exposure to pacemaker complication.

Concerning children gender more than three quarters of them were males. Less than half of children ranked as middle child, followed by who were the first child and the minority were the last one. From the researcher point of view, children who were ranked the first child, had less incidence of congenital heart diseases due to the effective prenatal follow up. On the same line, Villain (2015) studied pediatric cardiac pacing: indications implant techniques, among children in French and highlighted that the majority of children who were implemented pacemakers were males.

In relation to mothers' age the recent study's results evident that more than two fifth of the mothers were in the age group between 30-39 years old, with a mean of age 33.70 ± 6.37 years. This result was confirmed by Bass, Pat, Gandel, and Glenn, (2015) who studied children living with a pacemaker or implantable cardioverter defibrillator in London and found that mothers who had children with pacemaker increased significantly at age (20-24) years as detected in more than one third of the mothers. On the other hand, Villain (2015) studied pediatric cardiac pacing: indications implant techniques, among children in French found that more than half of the studied children with pacemaker were for mothers aged more than 35 years old. From the literature which demonstrated that age extremes at pregnancy time are a risk factor in having child with congenital anomalies.

Concerning mothers' level of education, it was found that less than one third of mothers finished secondary school and the minority finished higher education. The result reflected that higher literacy rate among Egyptian mothers. On the same line, the Egypt Demographics Profile (2015) assured that, the literacy rate among females was 63.5% compared to 59.4% in 2016. So efforts of governmental and non-governmental organizations should continue to focus on female' education because low levels of literacy, and education in general, can impede the economic development of a country in the current rapidly changing, technology-driven world, this of course will reflect positively on the health care system as a whole.

As regards mothers' occupation, the study results proved that the highest percentages of the mothers were housewives; Similarly, an Egyptian study conducted by Galal, Mohamed, Abdelkreem and Elsis (2016) to evaluate the effect of nursing guidelines for nurses on occurrence of selected post therapeutic cardiac catheterization complications among children at Cairo, and indicated that 93% of mothers were housewives. As well as Kamel, Mohamed , Abdelkreem and Ahmed (2015) indicated that the majority of mothers were housewives. From the researcher point of view, most of Egyptian mothers preferred to stay at home to provide care for their husband and children specially, if they had chronic ill member in the family.

The current study's results illustrated that three quarter of the mothers live in rural areas. According to Kamel, et al. (2015) indicated that mothers in their study lived in rural areas and it has provided a background in which the genetic disorders are increasing. From the researcher point of view, people preferred to marry from relatives in some rural areas. This result agreement with Ekwochi, Asinobi , Osuorah, Ifediora , Amadi and Sunday (2017) who investigate Pattern of Congenital Anomalies in Newborn Factors and reported significantly associated with congenital anomalies and place of residence ($p = 0.011$).

As regards diagnosis the study results showed that, less than two thirds of the children had Tetralogy of Fallot while about one third of them had more than one cardiac disorders and only one fifth had Transposition of Great Arteries. The finding went in the same line with an Egyptian study conducted by Galal, et al. (2016) explored that the majority of children who performed cardiac catheterization had Tetralogy of Fallot and about one third had Transposition of Great Arteries and also Mohammed (2017) studied the effectiveness of educational program on knowledge and practices of patient undergoing to permanent pacemaker supported the same results by finding that the majority of children who had congenital heart disease diagnosed as Tetralogy of Fallot while the minority had Transposition of Great Arteries. In relation to the number of hospitalization, the vast majority of the studied children was hospitalized for more than six times and the minority hospitalized less than 6 times. Regarding causes of hospitalization most of the studied children hospitalized for treatment and the rest was hospitalized due to complications. It could be interpreted that because the hospitals in rural areas are not well prepared to carry out this type of these surgeries. These results matched with Villain's study results (2015) who studied pediatric cardiac pacing: indications implant techniques, among children in French.

It was evident in the results of the current study that the total mean mothers knowledge about pacemaker, care, diet , accident prevention and general hygienic care before receiving nursing instructions were less than the same items after receiving nursing instructions. There was statistically significant difference was detected between total mean score of mothers knowledge's before and after receiving the instructions. Furthermore, Gabriel, Melvin. Cheitlin and Alicia, (2015) found the same phenomenon when they studied guidelines for implantation of cardiac pacemakers and antiarrhythmia devices. The finding contradicted with, Kammeraad, Rosenthal , and Bostock (2014) who found that total mean score of mothers knowledge's before and after receiving instructions were nearly equal when they performed study at India on 10 mothers of children who implemented pacemaker instructions about pacemaker implantation in infants. From my point of view, these changes could be related to the effectiveness of the teaching instructions.

In relation to level of knowledge before and after receiving nursing instructions, it was highlighted that more than two thirds of mothers had unsatisfactory level of knowledge before receiving the instructions compared to about one third of mothers had unsatisfactory level of knowledge after receiving it. The results demonstrated that, mothers reported more satisfactory level of knowledge after receiving the nursing instructions than before receiving it, there was statistically significant difference was detected between mothers' level of knowledge before and after nursing instructions. The same finding was mentioned by Gabriel, Melvin.

Cheitlin, Alicia, (2015) who found the same phenomenon and found that there was statistically significant difference was detected between mothers' level of knowledge before and after receiving guidelines. From my point of view, these changes could be related to the effectiveness of the teaching instructions.

Clearly, the study's results indicated that the highest percentages of arrhythmia, chest pain, dislocation, injuries and loss of battery as pacemaker complication before receiving instructions and there was high statistical significance in percentage of pacemaker complication among children as a child's outcomes before and after receiving instructions. However, regarding to incidences percentages of tachypnea, bradypnea, dyspnea, orthopnea and presence of cough respectively as respiratory efficiencies before receiving guidance also were more than the same percentages after receiving guidance. There is high statistical significance in respiratory and cardiovascular efficiencies among children as a child's outcomes before and after receiving guidance. Kammeraad, Rosenthal, and Bostock (2014) indicated that there were positive effect of instructions on post pacemaker complications

V. Conclusion

The current study results concluded that mothers who received the teaching instructions had higher total mean score of knowledge regarding pacemaker and care of their children connected with pacemaker than before. As well children of the mothers who received the teaching instructions exhibit better outcomes as regards pacemaker complications, respiratory and cardiovascular efficiencies. These results support the proposed study hypotheses.

VI. Recommendations

Based on the results of the current study, it was recommended that:

- Raising the awareness of mothers about caring children with permanent pacemaker through in health education sessions about the pacemaker, nutrition, activity, treatment and child's outcomes.
- Simple Arabic illustrated booklet about the pacemaker, nutrition, activity, treatment and child's outcomes should be available and distributed to mothers in arrhythmia out-patient clinic at the Preventive Medicine and Social Center.
- Longitudinal study is necessary to monitor the late postoperative complications and long term outcomes.

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