

Respiratory Problems of Children with Cerebral palsy: Effect of Educational Program for their Mothers' Performance

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Abstract: Background: Children with cerebral palsy (CP) face challenges not only from their underlying medical conditions, but also from limitations in equipments and systems needed to support them. Children with cerebral palsy having many conditions which contribute significantly to respiratory problems, whereas; swallowing difficulties, weak cough, recurrent chest infections, pneumonia, frequent aspiration, all contribute to accidental inhalation of oral secretions, food, drink, and stomach contents into the lungs. Respiratory problems can lead to serious health risks for children with cerebral palsy and are at higher risk of atelectasis and airway obstruction from mucus plugging. Therefore, they eventually require assistance with breathing and airway clearance especially during sleep. **The aims of the study were to:** Assess the mothers' knowledge and performance regarding care for their children with cerebral palsy having respiratory problems, designing and implementing an educational program for mothers about care of respiratory problems and evaluating the effectiveness of educational program on improving the mothers' knowledge and performance and reducing recurrent respiratory problems of their children. **Methods:** A quasi experimental design was utilized. **Subjects:** A purposive sample composed of 120 mothers and their children with cerebral palsy having respiratory problems. **Setting:** Outpatient Clinic of Pediatrics Neurology at Children's Hospital affiliated to Ain Shams University Hospitals. **Tools:** (A) Pre/ post interviewing questionnaire to assess mothers' knowledge and practice about CP children with respiratory problems, B) Observation sheet, C) clinical records, D) Guideline booklet for mothers of children. **Results:** : There was improvement in mothers' knowledge and practices as regards CP children with respiratory problems post program implementation that reflected statistically significant differences. **Conclusion and Recommendations:** The developed instructional guideline program showed significant improvement in mothers' performance regarding respiratory problems of their children with cerebral palsy. The study recommends improving the mothers' performance regarding respiratory problems of their children.

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Introduction

Respiratory problems can lead to serious health risks for children with cerebral palsy. Respiratory conditions commonly associated with cerebral palsy which requires identification, treatment and prevention, include; aspiration, pneumonia, asthma, breathing problems, bronchiolitis, Bronchopulmonary dysplasia, gastro-esophageal reflux (GER), and respiratory complications. Maintaining optimal respiratory health is a key component to life expectancy in children with cerebral palsy. The goal of respiratory intervention is to increase quality-of-life, promote healthier breathing options, and reduce risk of (or prevent) life-threatening health conditions (**Bach and Kang 2000 & Chatwin et al., 2003**).

Cerebral palsy is non-progressive, meaning the brain injury or malformation will not progress in severity. However, secondary conditions resulting from the brain damage may develop and change over time. For example, brain injury can cause facial

muscle impairment which does not change over time. Chewing, swallowing and aspiration can occur when facial muscles are impaired. Aspiration can lead to pneumonia, whereas pneumonia is a health condition that can become worse or better over time, children with cerebral palsy are often exposed to serious lung conditions, like bronchopulmonary dysplasia and respiratory distress syndrome (**Hollins et al., 2011 & Arvedson et al., 2012**).

Children with cerebral palsy have a high incidence of respiratory problems related to or dependent on the underlying disability, this condition will be represented in asthma, among severely disabled children deaths were a result of pneumonia, cerebral palsy has shown aspiration which likely to be recurrent of non-sterile oral and upper respiratory secretions into the lower airways because of inadequate protective reflexes (**Plioplys et al., 2009**).

Respiratory problems for child with cerebral palsy present in a variety of ways, but most often as

variations on the following themes; recurrent chest infections (pneumonia, aspiration, asthma), noisy breathing (asthma, upper airway obstruction, aspiration with strider), persistent cough (asthma, aspiration), life threatening apnea episodes (obstructive sleep apnea), and respiratory infection (respiratory muscle weakness) (**Casas et al., 2007**).

It is common for children with cerebral palsy, especially severe forms to experience respiratory complications. Proper respiratory function depends on the ability to breath properly, cough correctly, and identify respiratory infections promptly. Children with cerebral palsy, especially those who are not able to communicate, are often unable to disclose discomfort while problems go undetected for long periods of time. If children experience trouble controlling muscle function and have feeding or swallowing difficulties, they may also be unable to cough up material left in the passageways, which can contribute to respiratory infection. Again, coughing is a complex activity which requires both forceful contraction of expiratory abdominal and intercostals muscles, and precise coordination and timing of expiratory and glottis muscles. The cough mechanism is often unsatisfactory in children with cerebral palsy to promote respiratory functions (**Rogers et al., 2009**).

Recurrent aspiration, results in acute lower respiratory infections (clinically obvious) and chronic lower airway inflammation and damage. The latter may go unnoticed for some time, but ultimately may cause both bronchiectasis and lung parenchyma damage. Once bronchiectasis has occurred, this further impairs clearance of airway secretions and predisposes to lower airway infection. Aspiration in the child with disability often occurs "silently" that is, without obvious cough or choking (**Mirrett et al., 2008**).

Deep breathing exercises are sometimes used as a form of relaxation, that, when practiced regularly may lead to the relief or prevention of symptoms commonly associated with asthma and deep breathing exercises can be used to help ease the discomfort of mild asthma attacks. Also, children with cerebral palsy have a tendency to breathe in slow deep breaths, so regular intervals of certain types of deep breathing exercises can help to retrain and strengthen tired lungs. Deep breathing involves slow and deep inhalation through the nose, usually to a count of 10, followed by slow and complete exhalation for a similar count. The process may be repeated 5 to 10 times, several times a day (**Abrahams and Burkitt 2007**).

Most children with cerebral palsy eventually require assistance with airway clearance and with breathing, especially during sleep. Techniques and

devices for airway clearance and noninvasive ventilation that are commonly used in adults have been successfully adapted for use in infants and young children. Both physiological differences and small size of young patients with cerebral palsy disease, however, can limit the applicability of such interventions or require special consideration. Measurements to identify the appropriate time to begin airway clearance assistance are lacking for young children, and the role of early introduction of noninvasive ventilation to preserve or enhance lung growth and chest-wall mobility remains to be elucidated. Despite these issues, a greater number of children with cerebral palsy are living well past their second decade. Strategies to transition these patients to appropriate child-care providers, to secure cost-effective health care for them, and to help integrate them into adult society must be developed (**Remacle et al., 2004**).

If a child has a structural deformity, such as curvature of the spine, muscle tone and gravity may contribute to chest wall deformity, which in turn can lead to restricted lung function and the potential for unequal lung expansion. When breathing is labored, it predisposes a child to respiratory dysfunction and in some extreme cases failure (**Lawless ST et al., 2005**).

Justification of the problem

Children with cerebral palsy have many conditions which contribute significantly to respiratory problems, whereas; swallowing difficulties, weak cough, recurrent chest infections, pneumonia, frequent aspiration, all contribute to accidental inhalation of oral secretions, food, drink, and stomach contents into the lungs. Also, limited mothers' knowledge and performance does not provide proper care for their children with cerebral palsy having respiratory problems. Consequently, mothers are urged to assess their children respiratory condition, breathing functions and coughing mechanisms. From here, the researchers highlights on the mothers' knowledge and performance regarding care of their children with cerebral palsy having respiratory problems.

Aims of the study

The aims of this study were to:

1. Assess the mothers' knowledge and performance regarding care for their children with cerebral palsy having respiratory problems
2. Designing and implementing an educational program for mothers about care of respiratory problems.
3. Evaluating the effectiveness of educational program on improving the mothers' knowledge

and performance and reducing recurrent respiratory problems of their children

Research Hypothesis

The educational program for mothers about care of their children with cerebral palsy and having respiratory problems will improve the mothers' knowledge and performance and reducing the recurrent respiratory problems for their children.

2. Subjects and Methods

Design:

A quasi experimental study was utilized.

Setting:

The study was conducted in Outpatient Clinic of Pediatrics Neurology at Children's Hospital affiliated to Ain Shams University Hospitals.

Subjects:

Sample size and Characteristics:

A purposive sample composed of 120 children with cerebral palsy and their accompanying mothers were participated in the study. On the basis of inclusion criteria: Children age ranged from 4 to 16 years old, with recurrent respiratory infection, not suffering from other complications.

Tools of data collection:

Data were collected through using the following tools:

I. An Interviewing Questionnaire (pre/post educational program): It was designed by the researchers after reviewing relevant literature to assess the mothers' knowledge regarding respiratory problems of their children with cerebral palsy. It was written in simple Arabic language, its content validity was assessed by expert consultants from the pediatric nursing department. The questionnaire includes two main parts:

Part 1: It was concerned with mothers' characteristics namely; age, educational level, employment. And, children' characteristics such as age.

Part 2: It was concerned with mothers' knowledge regarding respiratory problems of their children with cerebral palsy, in the form of;

- Concept of breathing exercises and its objectives.
- Symptoms of respiratory problems and respiratory infection.
- Importance and contraindications of breathing exercises, coughing technique, therapeutic vibration, and postural drainage.
- Relation between respiration and swallowing.
- ❖ Questions were in the form of open and close ended, the questionnaire took about 20 – 25

minutes to be filled by the researchers for each mother.

The total score of the mothers' knowledge was 50 grades (equal 100%) and accordingly the mothers' answers were classified as satisfactory knowledge (50% and more) or unsatisfactory knowledge (less than 50%). A pre designed key answer was used; accordingly answers obtained were checked to be satisfactory and unsatisfactory knowledge.

II. An Observational Checklists (pre/post educational program): It was adopted from **Bowden, R. and Smith, G. (2003)** it was utilized to assess the actual mothers' performance as regards:

- Breathing exercises which relieve children breathing difficulties namely; diaphragmatic breathing, pursed lip breathing, effective coughing, chest percussion, vibration and postural drainage, effective exercises for relieving drooling and promote swallowing ability to avoid choking and aspiration pneumonia.
- Assessment of the mothers' performance towards breathing exercises for their children with breathing difficulties took 30 – 60 minutes. Twelve scores were allocated for each procedure for 12 items, whereas "one" degree for each step done correctly and "zero" for not done. Accordingly, mothers' performance were categorized into either done correctly.

III. Clinical Records: It was used to collect data about children' health status as regards; recurrence of chest infection as bronchitis, pneumonia by each type, respiratory symptoms and complications of each child, hospital admission, its causes and duration. Clinical record also used to monitor children progress, treatment stages, investigations and vital signs.

IV. Arabic handout about care of respiratory problems: It was designed and disseminated by the researchers to provide the mothers and their cerebral palsy children with essential information about normal respiration, types of Respiratory problems and its care to attain optimal level of health status for those children.

Validity and reliability

It was ascertained by a group of experts including medical and nursing personnel in pediatric neurology clinics. Their opinions were elicited regarding to the tools format layout, consistency and scoring system. The content tools were tested regarding to knowledge, practices accuracy, relevance and competence.

Pilot Study

It was done to test the study tools. It was carried out on 10% of study subjects (12 mothers and their children with cerebral palsy and have respiratory problems). Results of data obtained from the pilot study were helped the researchers to modify the study tools. Items were accordingly corrected, omitted or added as needed, the tools were thereafter revised, redesigned, and rewritten with the objective of improving its accuracy and consistency, and the final form of the tools were then obtained. The subjects involved in the pilot study were excluded from the study sample.

Procedure Technique

This study was conducted in a period of nine months started at March and ended by **November 2009**. Divided as 4 weeks for assessment phase and pre test, 28 weeks for implementation phase, ended by 4 weeks for evaluation phase and post test. Agreement to conduct the study was obtained from the head of Neurology Outpatient Clinic. The current study was carried out on three phases namely;

I. Assessment Phase:

The researchers allocated 8 days to collect data about the study subjects by interviewing the on Sunday and Wednesday for 4 weeks at the clinic time from 8 am to 1 pm. Each mothers and her/his child was interviewed individually, the time consumed to fill the questionnaire format ranged from 25 – 35 minutes. The questionnaire included:

- A- Assessment of mothers and their children characteristics such as; age, sex, level of education.
- B- Assessment of mothers' knowledge and facts related to respiratory problemes and its recurrence, duration, symptoms, concept of breathing exercises and its importance, contraindications, and relation between respiration and swallowing.
- C- Assessment of mothers' practices as regards breathing exercises such as; effective coughing, percussion and vibration, and postural drainage.

II. Implementation Phase:

The researchers allocated 28 hours to cover the theoretical and practical sessions, 10 hours to cover the theoretical sessions that included 3 main parts:

Part 1 (3 sessions = 3hours).

It deals with concept of breathing exercises and it's objectives, effect of cerebral palsy on respiratory system, and normal rate of 7ii8 respiration in children.

Part 2 (3 sessions = 3 hours).

It consisted of clinical manifestations of Respiratory problems and inflammation, concept of drooling, relation between respiration and swallowing, causes that prevent nasal respiration.

Part 3 (4 sessions = 4 hours).

It concerned with instructions and measures for relieving drooling, improving swallowing and decreasing aspiration pneumonia, emphasis on mothers' role to allay the physical, cognitive, psychological and social problems to improve the general condition of their children with cerebral palsy which reflected on their breathing in form of relieving Respiratory problems.

Regarding to the practical sessions, 18 hours were allocated for practical procedures demonstration and re- demonstration, four and half hour for each procedure as the following:

- 1- Breathing exercises and diaphragmatic breathing indicated for strengthen the diaphragm during breathing and promote maximum alveolar inflation, the researchers advised the mothers to encourage their children work up to 5 minutes several times a day before meals and at bed time.
- 2- Effective coughing exercises which maintain airway patent by permitting removal of secretions from both the upper and lower airways, after demonstration and re-demonstration advised mothers to continues practices of coughing exercises 2 to 3 times every 2 hours.
- 3- Percussion and vibration: Percussion involves hitting the chest wall with a cupped hand over the affected area and rhythmical pattern, while vibration is a fine shaking pressure applies to the chest wall during expansion only. Mothers informed that the purpose of these techniques increases the velocity and facilitate secretions removal and repeat percussion, vibration and coughing until their child no longer expectorates mucous and must followed by oral hygiene, but it should be performed one hour before the meal time or 1 to 3 hours after meals to avoid vomiting and aspiration.
- 4- Measures that reduce drooling and promote swallowing: As gum's massage, balloon inflation, tongue exercises which promote chewing, swallowing and reduce drooling as well as Respiratory problems.

Total hours were 28 hours for each group divided into 10 group that consumed 280 hours, each group consisted of 12 mothers and their accompanying children. The researchers take into considerations the subjects level of understanding, motivation and reinforcement techniques as a parse them to enhance learning and provide emotional support.

Teaching methods used were lectures, group discussions, demonstrations, and re- demonstrations, while the instructional media used were data show

and computer, colored posters, handouts and white board.

III. Evaluation Phase:

The researchers allocated 4 weeks to evaluate the outcome of their educational program on mothers' performance as regards care of their children with cerebral palsy and having Respiratory problems, and consequently to what extent the respiratory condition was improved, the researchers using the same tools of assessment phase immediately after program implementation.

Statistical Analysis

The obtained data of the current study was revised, coded and presented in tables, then analyzed by using descriptive statistical measures as number, percentage, mean, standard deviation, Chi square, and t-test were used.

Ethical Considerations and Human Rights

An approval was obtained from medical and nursing administrators of the study settings and mothers and their children with cerebral palsy. A clear explanation of the nature of the study was offered for them. Anonymity was secured and the mothers were allowed to withdraw from the study whenever they want.

3. Results

Table (1) showed the socio demographic characteristics of the mothers and their children, where less than one third of mothers (32.5%) had age 30 to less than 40 years with $\bar{X} \pm SD 30.2 \pm 9.3$, while 45% of them were illiterate and only 10% of them were highly educated. This table also illustrated that less than half (45%) of children were aged from 8 to less than 12 years with $\bar{X} \pm SD 15.0 \pm 3.3$.

As observed from table (2) that more than half of mothers (54%) had satisfactory knowledge about symptoms of respiratory problems and infection before the program that changed to 87.5% after the program with $X^2 64.6$, while regarding the importance and contraindications of postural drainage, it was reported that 10% of mothers had satisfactory knowledge before the program compared with the majority of them (89%) after the program. Also, this table showed that the relation between respiration and swallowing was known to 15% of mothers and changed to 71% after the program with $X^2 78.5$ that indicated that there was a highly statistical significant differences pre and post program.

Table (3) showed that, bronchitis (as Respiratory problems) was common among more than three fourth (79%) of children before the program while, their proportion was decreased to

27.5% with $X^2 64.3$ after the program. Also this table showed that recurrence of Respiratory problems during 6 months was two times among 79% of children with $\bar{X} \pm SD 30.1 \pm 1.2$ before the program and decreased to 35% with 2.9 ± 1.2 and $T = 1.3$ $P > 0.05$ after the program. In addition, the duration of Respiratory problems was <5 days among 70% of children with $\bar{X} \pm SD 9.7 \pm 5.7$ before the program while decreased to 29% with $\bar{X} \pm SD 9.5 \pm 5.5$ after the program and $T = 0.29$ at $P > 0.05$. Regarding previous child hospitalization, it was found that 29% of children were hospitalized before the program compared to 14% of them after the program with $X^2 7.9$.

Table (4) showed that breathing slowly and deeply through the nose for one second was common among more than two thirds (66.6%) of children before the nursing intervention program, while 60% of them their breathing became slowly and deeply through their nose for three seconds after nursing intervention. Also these table showed that the length of expiration for three seconds in more than half (54%) while they can expiration for six seconds became 62%. In addition to frequency of breathing exercises per day before nursing intervention was zero while after nursing intervention became 70.8% with $\bar{X} \pm SD 21 \pm$ before and after ± 0.9 with $T = 25.4$.

Table (5) revealed that mothers practice regarding effective coughing that moves mucus for their cerebral palsy children with respiratory problems was less than one quarter (15.8%) before nursing intervention while, after nursing intervention they become about three quarter (72.5%), also consecutive cough that remove mucus completely was practiced among 17.5% before nursing intervention while, they increased after nursing intervention to 71.6%, furthermore these table illustrated that ability to examine sputum for viscosity among mothers was 44% before nursing intervention while, after nursing intervention they become 87.5% with $X^2 83.6$ these table indicated statistical significant differences.

As observed from table (6) that the minority of mothers (15.8%) had percussed appropriate area 1-2 minutes before the program compared to majority of them (90.8%) after the program with $X^2 109.4$, while 7.5% of mothers Vibrate the same area during the child exhales pre the program compared to 94.4% after the program. While, 12.5% of them were repeating percussion, vibration and coughing until child expectorates all secretion pre the program compared to the majority (87.5) of them post program with $X^2 129.6$. Also, there was highly

statistical significant differences pre and post program.

Table (7) showed that more than half of mothers (52%) hold their children head steadily and adequately during swallowing pre the program compared to 62% of them post program with $X^2 = 11.5$. Meanwhile, 15% of mothers encourage their children with cerebral palsy to nasal breathing during

feeding pre the program compared to the majority of them (85%) post the program with $X^2 = 121.4$. Furthermore, regarding mothers' practices on controlling tongue movement of their cerebral palsy children were 30.8% pre the program compared to 55.8% of them post the program with $X^2 = 16.6$. that revealed there was statistical significant differences.

Table (1): Distribution of mothers and their children with cerebral palsy having Respiratory problems as regards their socio demographic characteristics (No. =120)

Items	(No.=120)	%
I. Mothers' characteristics		
1. Age in years:		
• > 20	25	20.83
• 20 - >30	31	25.83
• 30 - > 40	41	34.17
• ≤ 40	23	19.17
$\bar{X} \pm SD$	30.2 ± 9.3	
2. Educational Level:		
• Illiterate	45	37.5
• Read and write	21	17.5
• Moderate education	44	36.6
• High education	10	10
3. Employment		
• Employed	78	65
• Unemployed	42	35
II.Children's' characteristics		
1. Age in years:		
• 4 > 8	21	17.5
• 8 > 12	56	46.5
• 12 ≥ 16	43	35
$\bar{X} \pm SD$	15.0 ± 3.3	

Table (2): Effect of the educational program on the mothers' knowledge as regards chest physiotherapy, and respiratory problems of their children with cerebral palsy before & after program implementation (No.=120)

Items of Knowledge	Before (No. = 120)		After (No. =120)		X^2
	No.	%	No.	%	
1. Concept of chest physiotherapy and its objectives.	15	12.5	102	85	126.3**
2. Symptoms of Respiratory problems & infections.	65	54	105	87.5	64.6 **
3. Importance and contraindications of:					
• Breathing exercises.	6	5	85	70	110.5 **
• Coughing technique.	37	30	98	81	63.0 **
• Therapeutic vibration.	18	15	96	80	101.7 **
• Postural drainage.	12	10	83	89	87.8 **
4. Relation between respiration and swallowing.	18	15	86	71	78.5 **

** = High statistical significant difference

Table (3): Distribution of children as regards their types of Respiratory problems and its recurrence before & after program implementation (No. =120)

Items	Before (No.=120)		After (No.=120)		Test of significance
	No	%	No	%	
1. Types of Respiratory problems					
• Bronchitis	95	79	33	27.5	$X^2 = 64.3^{**}$
• Aspiration pneumonia	67	55.8	12	10	$X^2 = 85.7^{**}$
• Interstitial pneumonia	43	35.8	13	10.8	$X^2 = 21.1^{**}$
2. Recurrence of Respiratory problems /6 months					
• Two Times	95	79	42	35	T = 1.3 , p > 0.05
• Three Times	76	63	20	16.6	
• Four Times & more	55	45.8	18	15	
$\bar{X} \pm SD$	301	1.2	2.9	± 1.2	
3. Duration of Respiratory problems /Days					
• < 5	85	70	35	29	T = 0.29, P > 0.05
• 5 - < 15	55	54.8	25	20.8	
• 15 - ≥ 20	60	50	22	18.3	
$\bar{X} \pm SD$	9.7	± 5.7	9.5	± 5.5	
4. Previous hospitalization related to Respiratory problems					
• Yes	35	29	17	14	$X^2 = 7.9^*$
• No	85		123		

Number is not exclusive * = Statistical significant difference ** = High statistical significant difference

Table (4): Distribution of mothers 'performance as regards breathing exercise (diaphragmatic breathing) technique for their children before & after program implementation (No. =120)

Mothers 'performance	Before (No.=120)		After (No.=120)		Test of significance
	No.	%	No.	%	
1. Breathing slowly and deeply through the nose					
• 1 Second	80	66.6	16	13	T = 10.9 *
• 2 Seconds	25	20.8	31	25	
• 3 Seconds	15	12.5	73	60	
$\bar{X} \pm SD$	1.5 \pm 0.7		2.48 \pm 0.7		
2. Length of inspiration					
• 4 Seconds	80	66.6	15	12.5	T= 11.4 *
• 3 Seconds	20	16.6	17	14	
• 2 Seconds	20	16.6	88	73	
$\bar{X} \pm SD$	2.7	± 1.1	4.3	± 1.1	
3.Length of expiration					
• 3 Seconds	65	54	5	4	T= 14.4 *
• 4 Seconds	32	26.5	10	8	
• 5 Seconds	12	10	30	25	
• 6 Seconds and more	11	9	75	62	
$\bar{X} \pm SD$	3.8 \pm	1.2	6.1 \pm	1.3	
4. Frequency of breathing exercises / day					
• 3 Times and more	0	0	85	70.8	T= 25.4 *
• Two Times	0	0	15	12.5	
• One Time	25	20.8	12	10	
• Not at all	95	79	8	6.5	
$\bar{X} \pm SD$	0.21 \pm	0.4	2.5	± 0.9	

* = Statistical significant difference

** = High statistical significant difference

Table (5): Distribution of mothers' performance as regards coughing technique for their children before & after program implementation (No. =120)

Items	Before (No.=120)		After (No.=120)		X ²
	No.	%	No.	%	
- Effective coughing that moves mucus	19	15.8	87	72.5	78.7 **
- Consecutive cough that remove mucus completely	21	17.5	90	75	79.9 **
- Practicing coughing technique from 2 to 3 times every 2 hours.	12	10	86	71.6	94.5 **
- Ability to examine sputum for viscosity , odor , amount and color changes	53	44	105	87.5	83.6 **

** = High statistical significant difference.

Table (6): Distribution of mothers 'performance as regards vibration technique for their children before & after program implementation (No. =120)

Items	Before (No.=120)		After (No.= 120)		X ²
	No.	%	No.	%	
1. Put child on appropriate position.	18	15	88	73	82.8**
2. Per cuss appropriate area 1-2 minutes.	19	15.8	109	90.8	109.4**
3. Vibrate the same area while the child exhales 4-5 deep breath.	9	7.5	82	68	94.4**
4. Repeat percussion, vibration and coughing until child expectorates all secretion adequate.	15	12.5	105	87.5	129.6**

** = High statistical significant difference

Table (7): Distribution of mothers' performance as regards swallowing difficulties and drooling for their children before and after program implementation (No. =120)

Items	Before (No. 120 = 100%)						After (No. 120 = 100%)					
	adequate		poor		absent		adequate		poor		absent	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1. Hold head steady during swallowing.	52	43	27	22	41	34	75	62	25	20	20	16
$X^2 = 11.5^*$												
2. Keep lip closed most time.	32	26	70	58	18	15	95	79	15	12	10	8
$X^2 = 69.1^{**}$												
3. Nasal breathing during feeding.	18	15	52	43	50	41	102	85	13	10.8	5	4
$X^2 = 121.4^{**}$												
4. Ballone inflation.	52	43	40	33	28	23	96	80	14	11.5	10	8
$X^2 = 43.2^{**}$												
5. Turn off candle from one breathing.	21	17	57	47.5	42	35	89	74	11	91	20	16.5
$X^2 = 81.0^{**}$												
6. Control tongue movement.	37	30.8	58	48	25	20.8	67	55.8	32	26	21	17.5
$X^2 = 16.6^*$												
7. Chewing.	76	63	24	20	20	16	72	60	35	29	13	10.8
$X^2 = 4.2$												

* = Statistical significant difference

** = High statistical significant difference

4. Discussion

Health of children is the first and foremost of the parental responsibility. Mothers are considered the most plentiful primary health care workers around the world, while the health education improves their abilities and in nutrition, hygiene and disease management in particular (**Abdelkader, 2008**). As stated by **Zapletal et al., (2009)** that health education will always remain the most rewarding and cost-effective approach to health care, the main target is the mother but the father is the usually the decision maker.

Assistance with airway clearance is a critical component in the care of children with cerebral palsy, because of their propensity to develop mucus plugging and atelectasis with chest infections, and their greater exposure to common viral respiratory illnesses. In fact, acute respiratory illness leading to respiratory compromise is found to be the most common cause of unplanned admission to a pediatric intensive care units (PICUs) among children with cerebral palsy disease (**Blum et al., 2009**). From here, the aims of this study were to assess the mother's performance towards their children with cerebral palsy and have respiratory problems and implemented an educational program about care of their children

The current study showed that less than half of children aged from eight to less than twelve years. This finding coincided with **Hill (2008)** who reported that respiratory problems can strike any age group of children with cerebral palsy, whereas susceptibility of respiratory problems increases for children with severe forms of cerebral palsy, to experience respiratory complications.

Findings of the current study declared that a minority of mother's had satisfactory knowledge regarding their children with cerebral palsy and have respiratory problems and its intervention before program implementation. This could be attributed to lack of simple Arabic references about respiratory problems and cerebral palsy, no available time for physician and nurses to provide mothers with proper knowledge, low mother's educational attainment, limited qualifications of nurses and health providers as physiotherapist who are the base sources of information. However, after program implementation, considerable improvement was detected as regards mothers knowledge which could be attributed to the frequent explanation about respiratory problems and cerebral palsy by the re respiratory problems & infections searchers, adding to motivating those mothers by providing them with posters. In similar study, **Simonds et al., (2010)** stated that, it is important for mothers of cerebral palsy children with respiratory problems to have detailed knowledge

about their respiratory problems and its care which contributes significantly to avoided recurrence of respiratory problems.

Concerning the symptoms of respiratory problems & infections more than half of mothers were knew it. This could be related to recurrence of respiratory problems & infections for their children with cerebral palsy this findings is congruent with **Hogg et al., (2011)**, who confirmed that children with cerebral palsy have a high incidence of recurrent respiratory problems which are multifactorial and may be related to or dependent on the underlying disability. Respiratory problems play a major role in the life quality and expectancy of cerebral palsy children.

Findings of this study revealed that a majority of cerebral palsy children had many types of Respiratory problems among studied children before program implementation as bronchitis, aspiration pneumonia, interstitial pneumonia and it occur more than three times / 6 months, furthermore it's duration from 15-20 days among half of them before program implementation. It could be due to several reasons: proper bolus formation, esophageal peristalsis, glottis closure, and "turn taking" between swallowing and breathing leads to recurrent aspiration of solids and liquids during feeding. Thin liquids are particularly prone to be aspirated and recurrent aspiration pneumonia. Another reason, mothers haven't enough knowledge and practice for how to avoid occurrence of respiratory problems or caring of their cerebral palsy children when they suffering from any form of respiratory problems. From here, the program improves mothers knowledge and practice towards their cerebral palsy children suffering from any form of respiratory problems. In this context, **Raphael et al., (2009)** pointed out that among cerebral palsy children 77% of deaths were a result of pneumonia; in a large community survey of children with cerebral palsy 52% of deaths were caused by respiratory problems. The reasons are poorly understood and taught, with vague concepts such as "hypostatic pneumonia". In short, aforementioned respiratory problems for children with cerebral palsy issues are documented by **Rosenberg and Lyons (2009)** who stated that respiratory problems for child with cerebral palsy present in a variety of ways, but most often as variations on the following themes, recurrent "chest infections" (pneumonia, aspiration, asthma), noisy breathing (asthma, upper airway obstruction, aspiration with stridor), persistent cough (asthma, aspiration), life threatening apneic episodes (obstructive sleep apnea), respiratory failure during fairly minor respiratory infection (respiratory muscle weakness, severe scoliosis).

The present study illustrated that none of the studied mothers can apply diaphragmatic breathing and its steps in suitable frequency per day, this is attributed to again diaphragmatic breathing is a complex activity which requires both forceful contraction of expiratory abdominal and intercostals muscles, and precise coordination and timing of expiratory and glottis muscles. While more than half of caregivers practiced their children to breathing slowly and deeply through the nose for one second before program implementation while after program implementation they practiced their children to breathing slowly and deeply through the nose increased to become for three second, also related to length of expiration less than one tenth of mothers practiced their children to expiate their breathing for 6 second and more before program implementation they increased to become three fourth of them after program implementation, furthermore frequency of breathing exercises per day were no practiced from any one of mothers 3 time and more per day before program implementation, while after program implementation it practiced from tow third of them, this improvement point to the important role of the program and the effective role of the researchers in teaching and training the mothers and taught each mother individually about the importance of diaphragmatic breathing steps and mothers repetition of it three times per day, let them demonstrate procedure techniques in front of the researchers. As reported by **Croteau and Cook (2011)** that the successful dealing with cerebral palsy children who have respiratory problems depends on mothers. Thus they should work to understand child's need in dealing with respiratory problems can play an integral part in promoting cerebral palsy children's respiration.

Regarding mother's practice for secretion removal and airway clearance for cerebral palsy children with respiratory problems, the study revealed that, there was a high statistical significant deference between before and after program implementation, related to coughing technique the study denoted that the majority of mothers haven't any role towards dealing with airway clearance through coughing technique before program implementation, while after program implementation they improved in managing their children with excessive airway secretion. This could be due to mother's interest in clearance their children airway, to comfort them and they motivated to implement it correctly and satisfactory. This finding is supported by **Papastamelos et al., (2008)** who demonstrated the beneficial effects of coughing technique done by mothers for cerebral palsy children with respiratory problems that maintain their airway clearance and

improve their children growth and development **Leith et al., (2010)** added that Proper respiratory function depends on the ability to breath properly, cough correctly, and identify respiratory infections promptly. Children with cerebral palsy, especially those who are not able to communicate, are often unable to disclose discomfort while problems go undetected for long periods of time, so proper coughing technique done by mothers for cerebral palsy children with respiratory problems is very important, furthermore half of mothers had ability to examine sputum for viscosity, odor, amount and color changes before program implementation, while after program implementation they increased to become more than tow third which revealed the benefit of the program.

In similar study done by **Yates et al., (2004)** cough is the chief mechanism responsible for clearing the central airways of secretions when the mucociliary escalator is made ineffective or is overwhelmed by infection and increased mucus production. A normal cough requires a pre-cough inspiration to 60–90% of total lung capacity, followed by brief glottis closure and simultaneous contraction of expiratory muscles. The glottis then opens and the pressurized thorax forcibly expulses air at a high flow.

Regarding studied mothers' practices about vibration technique to decreasing the viscosity of mucous that facilitate its drainage for their cerebral palsy children with respiratory problems before program implementation this study illustrated that there was high statistical significant improvement in their practice after program implementation, where the majority of mothers haven't any role towards vibration the same area while the child exhales 4-5 deep breath before program implementation, while after program implementation they improved in managing their children with vibration technique. This could be due mothers' interested in comfort their children respiration and they motivated to implement it correctly and satisfactory. This finding is supported by **Gauld and Boynton (2005)** who demonstrated the beneficial effects of vibration technique for cerebral palsy children with respiratory problems that prevent the development of serious respiratory problems and children maintain adequate gas exchange and can have gain normal growth as a result.

Considering mother's practices toward swallowing difficulties and drooling for their cerebral palsy children with respiratory problems before program implementation, majority of them did not practice exercises which strong. Chewing and swallowing muscles such as Pallone inflation turn off candle from one breathing it could be related to

several reason mothers didn't not realize that there is a relation between chewing, swallowing and respiration, aspiration in the child with cerebral palsy often occurs "silently", that is, without obvious cough or choking. Another reason, importance of practicing this exercises are overlooked from the healthcare providers. These result emphasized on the patient need for health education to increase their level of awareness that lead to acceptance of the importance of practicing exercises which strong. Chewing and swallowing muscles. This finding is congruent with **Chaudri et al., (2009)** who confirmed that recurrent aspiration results in acute lower respiratory infections (clinically obvious) and in chronic lower airway inflammation and damage. The latter may go unnoticed for some time, but ultimately may cause both bronchiectasinchymal damage. Once bronchiectasis has occurred, this further impairs clearance of airway secretions and predisposes to lower airway infection. In this context, **Bach and Saporito (2010)** added that respiratory functioning, as well as swallowing and chewing difficulties, is a factor in reduced life expectancy for children with cerebral palsy, if children experience trouble controlling muscle function and have feeding or swallowing difficulties, they may also be unable to cough up material left in the passageways, which can contribute to infection. Respiratory dysfunction can lead to malnutrition. Respiratory distress makes it difficult for the body to function and can lead to life-threatening heart conditions. Difficulty in swallowing and feeding can lead to the inhalation of food particles. This can cause infection in the lungs or pneumonia, which are also of concern. Severity and frequency of respiratory infection is a significant life expectancy factor.

Conclusion:

The present study concluded that the application of an educational program for mothers about care of their children who were suffering from cerebral palsy and having respiratory problems had a positive effect in improving the mothers' knowledge and performance and reducing the recurrent of respiratory problems for their children.

Recommendations:

Based on the findings of the present study, the researchers recommended the following

1. Replicated the study with large sample size to be generalized.
2. Written guidelines for prevention of recurrent respiratory problems for children with CP should be available in all Outpatient Clinics of Pediatrics Neurology.
3. Further studies to assess the mothers' knowledge and performance regarding care for their children with cerebral palsy and having respiratory problems must be done in Outpatient Clinics of Pediatrics Neurology in all hospitals.
4. Providing the mothers with updating booklets, pamphlets and boosters to acquaint them with essential knowledge and practices about how to provide care for their children with cerebral palsy having respiratory problems in all health care settings.

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