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Effect of Pulmonary Care on the Occurrence of Atelectasis in Infants at the First Year of Life under Abdominal Surgeries

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Abstract: *Surgery and general anesthesia directly affect the respiratory system. Postoperative pulmonary complications occur after upper abdominal surgery.. Breathing and chest wall physiotherapy have been used to prevent atelectasis.* ***The study aimed*** *to identify the methods of pulmonary care used to avoid occurrence of atelectasis in the first year of life of infant undergoing abdominal surgeries, determine effect of pulmonary care on the occurrence of atelectasis in the first year of life undergoing abdominal surgeries. The study consist of 60 infant undergoing to abdominal surgery in surgical unit at Tanta University Hospital. Five tool were used for data collection Preoperative Assessment Sheet ,Intraoperative Assessment sheet Postoperative Assessment Sheet, pulmonary Care Sheet. Pulmonary Care Evaluation Sheet.* ***Results****: their was a statistical significant difference in oxygen saturation after breathing exercise It was observed that the highest value of oxygen saturation was in third day at fifth position and the lowest value of oxygen saturation was observed in the first day . There was a statistical significant difference in oxygen saturation after three days* ***. It was concluded*** *that chest physiotherapy performed in postoperative period following upper abdominal surgery improved the oxygen-hemoglobin saturation and reduced pulmonary complication.* ***Recommendation****. In service training Program should be conducted for the nurses about effect of chest physiotherapy in prevention of postoperative pulmonary complication.*

Kay wards: *Pulmonary Care, postoperative , and Pulmonary Complication*

I. Introduction

Surgery and general anesthesia directly affect the respiratory system; upper abdominal surgery alters postoperative pulmonary function, as observed by impairment of lung volumes such as total lung capacity, vital capacity and tidal volume. It also reduces the efficiency of efforts to cough for as long as one week. There are also falls in oxygen arterial pressure and in oxygen-hemoglobin saturation. Postoperative pulmonary complications occur after upper abdominal surgery at a rate ranging from 6 to 70% of infants, depending on the criteria for defining them. They may include atelectasis, pneumonia or hypoxemia [1-2]

Breathing and chest wall physiotherapy have been used to prevent atelectasis. Respiratory exercises during hospitalization has been shown to improve respiratory muscle strength, oxygenation, coughing mechanism, chest wall mobility and lung ventilation, as well as decreasing respiratory work and preventing postoperative pulmonary complications. The effects of different chest physiotherapy regimens have been evaluated among high-risk postoperative infants and none of them could be considered highly satisfactory with regard to preventing such complications .On the other hand, preoperative chest physiotherapy reduced the incidence of postoperative pulmonary complications and improved mobilization and oxygen-hemoglobin saturation after major abdominal surgery [3]

Pulmonary hygiene is a group of exercises and treatments to help child breathe better and to keep lungs healthy. Although many people need pulmonary hygiene, it is very important for child after abdominal surgery. Caregivers will work very closely to help lungs work as well as possible and to prevent problems. Pulmonary hygiene consists of breathing exercises and treatments, postural drainage, chest physiotherapy, quad assist coughing, and suctioning [4].

Postoperative pulmonary complications (PPCs) following surgery were remain an important cause of postoperative morbidity, contributing to significant increases in patient discomfort, length of hospital stay ,use of resources and overall hospital costs. PPCs have been defined as a pulmonary abnormality that produces identifiable disease or dysfunction that is clinically significant and adversely affects the clinical course of the patient Such complications include pneumonia , respiratory failure requiring mechanical ventilation for more than 48 hours after surgery, atelectasis and exacerbation of pre-existing chronic lung disease.[5]

Postoperative pulmonary complications remain all too common after surgery. The rate of postoperative pulmonary complications for North Americans is estimated to be as high as one million of every 45 million

people who undergo abdominal surgery. The Agency for Healthcare Research and Quality (AHRQ) estimates that four patients of every 1,000 who undergo surgery will experience postoperative respiratory failure, and eight of every 1,000 will experience a pulmonary embolus. This is more than the incidence of other postoperative complications measured by the AHRQ eg, hemorrhage or hematoma, hip fracture, physiologic and metabolic derangement, wound dehiscence [6].

Physiotherapy included in the multidisciplinary team contributes significantly to the better prognosis of pediatric patients undergoing abdominal surgery, as it prevents and treats pulmonary complications by means of specific techniques such as vibration, percussion, compression, manual hyperinflation, re-expansion maneuver, positioning, postural drainage, cough stimulation, aspiration, breathing exercises and mobilization [7].

Chest physiotherapy: is a technique that is mainly performed by the chest physiotherapist in which there is removal of excess of mucus (sputum) from the respiratory passage. The main objective of this technique is to mobilize the secretions, improve breathing pattern, clear the airway obstructions and strengthen the respiratory muscles and improved mobilization of bronchial secretions contributes to improved ventilation-perfusion matching and the normalization of the functional residual capacity (8)

Postural drainage therapy is a component of bronchial hygine therapy.It consist of postural drainage, positioning , turning and most often accompanied by chest percussion/ vibration. This procedure has been commonly used in combination with aerosol administration and other respiratory care procedures like chest physiotherapy, chest physical therapy, postural drainage and percussion and vibration. this therapy is meant to mobilize the bronchial secretions in order to normalize the functional residual capacity, based on the effect of gravity and external manipulation of thorax. After that secretions are drained from one or more lung segments to the central airways under the effect of gravity. Position should be held for 3-15 minutes [9]

Vibrations Is performed manually by pressing in the direction that the ribs and soft tissues of the chest move during expiration over the draining area. Vibration is the placement of
hands along the ribs in the direction of expiratory movement of the chest. A small rapid vibration (tremor) and slight pressure is applied during exhalation to accentuate this phase of the respiratory cycle. The maneuver mimics the forced exhalation of a cough. A vigorous form of this manual vibration combined with positive pressure ventilation is called an "artificial cough". This is used as an assist technique for sputum removal in paralyzed patients on ventilators. [10]

In uncooperative or small children tracheal stimulation or tickling can be done by placing index finger or thumb on anterior side of the neck against trachea just above sternal notch with gentle but firm inward pressure in circular pattern as the child begins to exhale. In certain diseases with respiratory involvement the child may have feeble or ineffective cough and cough reinforcement is of much help in such conditions. Here the child should be advised to cough out while the hand of the operator reinforces anticipated cough by synchronously compressing the lower half of the chest. Therapy, postural drainage with cupped hand percussion with cough reinforcement and suctioning or clearing the retained nasal and oral secretions is advised [11].

Assisted coughing can be useful for very weak children who have a lot of difficulty getting the phlegm to the back of their throats to swallow it. It involves putting your hand under the diaphragm, on the child's tummy and pushing firmly upwards to give more force to the cough. This technique is not difficult to do but needs practice to get the timing correct with the child's attempt to cough [12]

Pulse oximetry is a way to measure how much oxygen blood is carrying. by using a small device called a pulse oximeter, blood oxygen level can be checked without needing to be stuck with a needle. The blood oxygen level measured with an oximeter is called oxygen saturation level (abbreviated O2sat or SaO2). This is a percentage of how much oxygen blood is carrying compared to the maximum it is capable of carrying. Normally, more than 89% of red blood should be carrying oxygen.[13]

II. The aim of the study

This study is to Identify the methods of pulmonary care used to avoid occurrence of atelectasis in the first year of life of infant undergoing abdominal surgeries. And determine effect of pulmonary care on the occurrence of atelectasis in the first year of life undergoing abdominal surgeries.

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III. Materials and Method.

Design : Quasi experimental design was used in this study .

Setting: The study was conducted at Pediatric Surgical department at Tanta University Hospital.
Subjects: Sixty infant who are aged ranged from birth to 1 year, free from chest problems and other congenital anomaly unless it is direct relation to abdominal surgeries. Infant received pulmonary care schedule .
-Chest physiotherapy in the form of postural drainage ,percussion, vibration.

Five tools were used in the study :-

Tool I : Preoperative Assessment Sheet

It was developed by the researcher to obtain the demographic data of the infant which include Biosocial characteristic, Physical growth ,Physiological parameters , oxygen saturation in child blood .Lab investigation .

Tool II: Intraoperative Assessment Sheet

It was developed by the researcher to assess infant during operation it include ;-Age of the child at the time of operation, site of operation, endotrachial intubations ,length of wound, oxygen saturation ,duration of operation ,physiological parameters before leaving the operating room ,time of recovery from anesthesia .

Tool III: Postoperative Assessment Sheet

Physiological parameters abdominal assessment e.g inspection for wound site , length and presence of abdominal distention . Chest assessment to determine presence of respiratory distress as cyanosis, flaring nostril, grunting and costal or subcostal retraction.

Tool IV: pulmonary Care Sheet which included

Applied pulmonary care through suction & chest physiotherapy, it consisted of postural drainage, percussion and vibration at the first 3 day postoperative. Measuring Oxygen saturation after pulmonary hygiene - percussion may stimulate infant to cough .Add vibration on exhalation to assist mobilization of secretion, assess need for suction after each session, physiological parameters as temperature, heart rate and respiratory rate. Auscultate chest sound

Tool V: Pulmonary Care Evaluation Sheet which include

Evaluate the postoperative Pulmonary complication after given pulmonary care by assess physiological parameters as temperature, heart rate ,respiratory rate.. Need for oxygen therapy if pulse oximetry oxygen saturation < 90 % . Development of pulmonary complication and presence of respiratory distress as cyanosis, flaring nostril, grunting costal or subcostal retraction tachycardia.

IV. Method

1- An official approval for conducting the study was obtained from responsible authorities. Infants were interviewed with their mother at the inpatient surgical unit-Every infant included in this study received pulmonary care postoperative. Every infant spent 30 minutes to complete the procedure ,

2- Ethical consideration confidentiality and privacy was put in consideration regarding the date collection

3- Content validity of the tool was performed by five experts in the field of nursing .

4- Pilot study was conducted on 10% of infants enrolled in the study to identify the obstacles and problems that may be encountered in data collection.

5- Preoperative phase assessment was performed for all infants preoperative to direct any deviation from normal which has been confirm by pediatric surgeon.

6- Postoperative phase the researcher performing pulmonary care (group of exercises) in the first 3 days postoperative to prevent the occurrence of respiratory distress through postural drainage percussion, vibration, assist coughing and suction Vital signs of the infants (respiratory rate, heart rate, temperature) and oxygen saturation were collected. Each infant was received postoperative chest physical therapy on the ward. Each chest physical therapy session lasted, on average, 20-30 minutes and included change position

-oxygen saturation checked before and after pulmonary care by pulse 0ximetry

Evaluating the effectiveness of pulmonary care done daily for the first 3 days postoperative by observing the respiratory rate ,heart rate and measuring oxygen saturation by pulse oximetry and temperature ,Time for maximum oxygen saturation in three days was recorded. Chest assessment for any sign of respiratory distress.

-Data collected through 7 month starting from January till the end of June 2012.

Statistical analysis Fisher's exact test or the chi-square test analysis was performed . To compare the numerical variables. In order to determine whether there was a difference in reducing the risk of developing pulmonary complications. All tests were performed using the intent-to-treat principle via the SPSS software (version 11.5). The statistical significance was set at 5% (p <0.05). where as unpaired *t*-test. The level of significance was get to a p value lower than 5% ($p<0.05$).

Limitation of the study: A limitation of this study was the number of sessions of postoperative physiotherapy .It was not possible to admit infants much earlier due to an increased risk of infection .This study did not investigate any visit to the control group during these infants stay .Although this could have improved the statistical comparison . Attention should be drawn to the fact that the infants who received chest physiotherapy

did not report any level of pain because the protocol did not have the of investigate whether physiotherapy during postoperative anesthesia recovery could induce pain .

V. Results

Table (1) percentage distribution of the studied infant according to their socio-demographic data.Itwas observed that mean age of the infants was 5.142±3.13 month. It was notice that 63.3% were boys while 36.7 were females . as regards birth order 53.3% the second birth order while 45% the first birth order .

It was observed from Table (2) relation between level of HB and presence of respiratory distress. It was evident that most of them (76.9%) respiratory distress and had Hemoglobin level of lower than normal compared to 23.1% above normal. There was statistical significant difference P=0.0001

Table (3) Showed relation between breathing exercise and O2 saturation among studied Infant at postoperative . It found that in the first day the mean value O2 saturation at five time was 92.64± 4.584 while 92.38± 4.91 , 95.50± 2.779at seven and ten time respectively , while in the second day the mean value at five time was 92.82± 3.863 . While at the seven and ten time 93.44 3.616 , 95.68 ± 4.671 respectively and in third day it was found significantly greater in the ten time .From this table there was a statistical significant difference in oxygen saturation after three days .

Table (4) illustrates relation between respiration rate and O_2 saturation before and after pulmonary hygiene sessions. It was found that the mean value of O_2 saturation before and after pulmonary hygiene in the first day was 92.73 ±3.46, 95.50 ± 2.772 respectively, while in the second day the mean value O2 saturation before and after was 92.73 ±3.81, 94.67 ±3.22 respectively and in third day it was 94.57 ±3.07, 98.73 ±1.64,.From this table there was a statistical significant difference in O2 saturation after three days .This table also showed that in the first day the mean value respiration rate before and after pulmonary hygiene in was 64.77 ±5.64, 59.25 ±5.17 respectively , while in the second day the mean value before and after was62.754 ±4.66 , 54.60 ±5.22 respectively and in third day it was 59.24 ±5.88, 52.30 ±5.73 From this table

Table (5) showed mean value of oxygen saturation after pulmonary hygiene in relation to position and period of follow up. This table showed that at the first day the mean value of oxygen saturation after pulmonary hygiene in the first position was , 92.73 ±3.465 ,while second day and third day was 93.66 ±3.164, 94.29 ±1.45 respectively . While in the second position the mean value at first ,second and third day was 94.00 ±4.6 ,95.14 ±2.523 , 96.36 ±3.64 respectively .It also was observed that the highest value of oxygen saturation was in third day at fifth position and the lowest value was observed in the first day . There was a statistical significant difference in difference in O2 saturation after three days. .This table also showed that in the first day the mean value respiration rate before and after pulmonary hygiene the mean value 64.77 ±5.64, 59.25 ±5.17 respectively , while in the second day the mean value before and after was62.754 ±4.66 , 54.60 ±5.22 respectively and in third day it was 59.24 ±5.88, 52.30 ±5.73 From this table there was a statistical significant difference in respiration rate after three days.

Table (6) Shows the relation between Intraoperative assessment and presence of respiratory distress . It was found that respiratory distress with site of operation above umbilical were 61.5% and 79.9% of studied infants length of wound 2-3cm .The table also showed that 61.55% of them had respiratory distress with duration of operation more than 2hrs .Regarding oxygen saturation in respiratory distress were 53.8% lower 90 % . Regarding to physiological parameters with respiratory distress above normal were 30.8%, respiratory rate and heart rate above normal were 84.6%, 61.5% respectively.

Table (1) :- Percentage Distribution of the Studied Infant according to their Biological Characteristics

Biological characteristics	Studied Infant(n=60)	
	No	%
Age (in month):-		
4>1-	12	20.0
4- 8	25	41.7
8-12	23	38.3
Range	1-12	
Mean ± SD	5.142± 3.13	
Sex		
Male	38	36.7
Female	22	63.3
Birth order		
First	27	45.0
Second	32	53.3
Third	1	1.7

Table (2) Relation between Preoperative Hemoglobin level (HB) and Presence of Respiratory Distress

HB level	**With R D** n=13		**Without RD** n =47		**Total No of infants(60)**		**P (X^2)**
	No	%	No	%	No	%	
Lower 10g/dl (less than normal)	10	76.9	46	97.9	56	93.3	0.001* (3.9)
above10 g/dl(normal)	3	23.1	1	2.1	4	6.7	

*Significant at level of 0.05%

Table (3) Distribution of Mean Value O2 Saturation in relation to Breathing Exercise among Studied Infant at First Second ,Third Day Postoperative

Breathing Exercise	**Oxygen saturation**			**P (X^2)**
	First day	Second day	**Third day**	
Five time Mean ± SD	92.64± 4.584	92.82± 3.863	92.82± 3.863	0.001* (11.6)
Seven time Mean ± SD	92.38± 4.91	±3.616 93.44	94.07 ± 4.194	0.014* (13.9)
Ten time Mean ± SD	95.50± 2.779	± 4.671 95.68	98.46 ±1.014	0.030* (18.7)

*Significant at level of 0.05%

Table (4) The Relation between Respiratory rate and O2 Saturation before and after Pulmonary Hygiene Sessions at the period of follow up

Variables	O2 saturation Mean ± SD	Respiration rate Mean ± SD	F	P
1st day				
before	92.73 ±3.46	64.77 ±5.64	47,070	0.001*
After	95.50 ±2.772	59.25 ±5.17		
2nd day				
before	92.73 ±3.81	62.754 ±4.66	35.151	0.001*
After	94.67 ±3.22	54.60 ±5.22		
3rd day				
before	94.57 ±3.07	59.24 ±5.88	61.188	0.001*
After	98.73 ±1.64	52.30 ±5.73		

*Significant at level of 0.05%

Table (5) : Table (5) : Distribution of Mean Value of Oxygen Saturation after pulmonary Hygiene and period of follow up

Position	oxygen saturationwas			**T test**
	1st day Mean ± SD	2nd **day** Mean ± SD	3rd **day** Mean ± SD	
Position 1st	92.73 ±3.46	93.66 ±3.164	94.29 ±1.45	**0.592**
Position 2nd	94.00 ±4.65	95.14 ±2.523	96.36 ±3.46	**0.050**
Position 3rd	95.16 ±2.67	95.68 ±2.307	97.54 ±.885	**0.014***
Position 4th	97.94 ±1.252	98.02±.958	98.46 ±.1.014	**0.017***
5th position	98.73 ±1.64	98.56 ±.929	99.00 ±.649	**0.005***

*Significant P 0.05

Table (6) :Relation between Intraoperative assessment and presence of respiratory distress

Intraoperative assessment	With respiratory distress n=13		Without respiratory distress n=47		Total No of infants(60)		P
	No	%	No	(%)	No	(%)	
Site of operation							0.005*
Above the umbilical	8	61.5	18	69.2	26	43.3	
below the umbilical	5	38.5	29	85.3	34	56.7	
Length of wound							0.001*
<3cm	2	15.4	1	2.1	3	5	
3-5cm	10	79.9	46	97.9	56	93.4	
>5cm	1	7.7	-	-	1	1.7	
Duration of operation							0.001*
1-2hr	5	38.5	35	74.5	40	66.6	
more than 2 hrs	8	61.5	12	25.5	20	33.4	
Oxygen saturation							0.001*
90<	7	53.8	-	-	1	1.7	
90-95	5	38.5	20	42.6	27	45	
95-100	1	7.7	27	57.4	32	53.3	
Endotrachial intubation							
Done	11	84.6	12	25. 5	23	38.3	-
Note done	2	15.4	35	74.5	37	61.7	
Time of recovery							
..>1hrs	5	38.5	42	89.4	47	78.3	0.001*
More 1hrs	8	61.5	5	10.6	13	21.7	
physiological parameters							
Temperature							--
normal 36-37.5C	9	69.2	32	68.1	41	68.3	
above normal 39C	4	30.8	15	31.9	19	31.7	
Respiratory rate							
Normal 25-35c/m							
normal 50 c/m above	2	15.4	18	38.3	20	33.3	
Heart rate	11	84.6	29	61.7	40	66.7	
130-140 b/m							
Above normal 160 b/m	5	38.5	30	63.8	35	58.3	
	8	61.5	17	36.2	25	41.7	

IV. Discussion

Surgery and general anesthesia directly affect the respiratory system. Upper abdominal surgery alters postoperative pulmonary function, as observed by impairment of lung volumes such as total lung capacity, vital capacity and tidal volume. It also reduces the efficiency of efforts to cough for as long as one week. There are also falls in oxygen arterial pressure and in oxygen-hemoglobin saturation. Postoperative pulmonary complications occur after upper abdominal surgery at a rate ranging from 6 to 70% of infants, depending on the criteria for defining them. They may include atelectasis , pneumonia or hypoxemia, among others.[1-2.]

Breathing and chest wall physiotherapy have been used to prevent atelectasis. Respiratory exercises during hospitalization has been shown to improve respiratory muscle strength, oxygenation, coughing mechanism, chest wall mobility and lung ventilation, as well as decreasing respiratory work and preventing postoperative pulmonary complications.[3]

The main function of respiratory physiotherapy in pediatric patients is to contribute to the removal of tracheobronchial secretions and to obtain better lung expansion, preventing or reversing atelectasis, and reducing the risk of lung infections. Physical therapy in the immediate postoperative period after abdominal surgery is an early treatment alternative, since it preserves pulmonary function.[4,5]

Regarding distribution of studied infants according to their socio demographic data in the present study it was found that the most of them are age ranged from 1-12 months this age is prone to postoperative complication

because elastic supporting structure of the lung is incompletely developed this puts the infants at greater risk for atelectasis because airway closure can occur .This result agree with **Reinius H**(2009)[14] who concluded that the infants contraction of the diaphragm may cause paradoxical inward movement of the highly deformable chest wall resulting in loss of lung traction .The resultant atelectasis could reduce ventilatory efficiency increase diaphragmatic fatigue and thereby further increase the tendency for atelctasis development .In addition type I and II muscle fibers are not fully developed in infants

The present study shows that relation between level of HB and presence of respiratory distress. It was evident that low hemoglobin concentration is a serious matter. Oxygen is needed by all vital tissues for normal function, and even more oxygen is required during exertion, shivering or fever. Anemia means that a given volume of blood can carry less oxygen to all parts of the body, and this is reflected in the increased mortality figures of various conditions when the infants suffering these conditions are also anemic

This large epidemiological study is the first to investigate the nature and extent of the combined effects of anemia and comorbidities on postoperative outcome in infants undergoing abdominal surgery, **Overend et al.,** (2007)[15] showed that preoperative anemia was associated with an increase of all postoperative adverse events, Specifically, low preoperative hemoglobin was an independent predictor for postoperative pulmonary complication outcome, the association with increased cardiac adverse events was caused by concomitant risk and factors prevalent in anemic infants.

The present study revealed that oxygen saturation of the infants at the first four days postoperative with chest physiotherapy was very effective in improving the 0xygen-hemoglobin saturation it was s .This result agree with **Mackay MR** (2008)[16] who found that chest physiotherapy during immediate postoperative period among infants undergoing upper abdominal surgery in the public university hospital , was very effective in improving the 0xygen-hemoglobin saturation during the immediate postoperative period. Breathing exercises could be adopted at post-anaesthesia care units with benefits for infants

It was observed in present study the effectiveness of physiotherapy in reducing risk or treating pulmonary complication caused by surgical procedure in infant with abdominal surgery physiotherapy contributes to the appropriate ventilation and successful extubation . Results of the present study revealed that the Incidence of pulmonary complication is less among studied infant, this result agree with **Schindeler MB** (2008)[17] who found that chest physiotherapy decrease occurrence of the postoperative pulmonary complication and hasten recovery this result congruent with Lic and **Zhou (2013)** [18]who conducted a study on postoperative pulmonary complication in infants who underwent abdominal surgery .They concluded that infants receiving chest physiotherapy are prone to develop fewer pulmonary complication .While the finding was incongruent with **Magusson** et al., (2010) [19] Pulmonary complications are frequent among children undergoing abdominal surgery and lead to increased length of hospital stay and death rate. The present study shows that chest physiotherapy performed immediately after upper abdominal surgery improves oxygen-hemoglobin saturation. Chest physiotherapy has been shown to prevent or even to improve breathing complications such as secretions, atelectasis and pneumonia, using a variety of techniques. Together with postoperative care, respiratory physiotherapy techniques seem to provide some benefit in reducing pulmonary complications. **Westerdahl** et al.,(2008)[20 conducted that the oxygen-hemoglobin saturation increased after physiotherapy. It is of interest to notice that, comparing the times before and after physiotherapy, the saturation increased even with the decay on the second day after surgery. Since these values did not last two days, it is reasonable to suggest that infants would benefit from additional chest exercises during and after surgery . Various factors contribute to the development of postoperative complications. The surgical procedure itself, performed in the abdominal region, is one such factor. Studies have demonstrated that this type of approach contributes to the development of postoperative complications, which are more common than are those resulting from thoracic or cardiac surgery

As regards to site of operation at the present study site of operation above the umbilical lead to respiratory distress . this result agree with **Pasteur** (2010)[19] who found that the incidence of significant respiratory muscle dysfunction after lower abdominal surgery is very low (2-5%) while that of upper abdominal surgery may approach (20-40%) furthermore **Canet,** etal. [20] Who observed that upper incision more than doubled the risk for PPC, as compared to lower abdominal incision. In infants undergoing extra thoracic surgical procedures, upper abdominal operations led to the most significant reductions in vital capacity, tidal volume, and functional residual capacity. The degree of fall in vital capacity correlated with the development of a clinical pulmonary complication. .

According to this research there is a direct relation between the complications after surgery and duration of operation. When the duration of operation was more than 2 hours, 66.6 % patients developed complications. As the duration increases, the incidence also increases 2-3 times .

VI. Conclusions

Based on the finding at the present study ,it can be concluded that the chest physiotherapy during the immediate postoperative period following upper abdominal surgery improved the oxygen-hemoglobin saturation , prevent pulmonary complication such as atalectasis

VII. Recommendation

Based on the finding at the present study, the following recommendation is suggested 1-They recommend a detailed pulmonary examinations in infants who will undergo upper abdominal surgery by chest physicians to identify the infants at high risk for postoperative pulmonary complications, to manage respiratory problems of the infants before surgery and also to help surgeons to take early measures in such infants before a most likely postoperative pulmonary complications occurrence 2- In service training Program should be conducted for the nurses about effect of chest physiotherapy in prevention of postoperative pulmonary 3- preoperative chest physiotherapy reduced the incidence of postoperative pulmonary complications and improved mobilization and oxygen-hemoglobin saturation after major abdominal surgery.

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