# Quality of Nursing Care Provided for Neonates with Tracheoesophageal Fistula

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**Abstract:**
Tracheoesophageal fistula (TEF) is an abnormal connection between the esophagus and the trachea. It is one of the most life-threatening anomalies in newborn. The current study aimed to assess the quality of nursing care provided for neonates with TEF and to assess the nurses' knowledge and performance regarding neonates with TEF. A descriptive exploratory research design was utilized in the current study. The study was conducted at the Neonatal Surgical Intensive Care Unit (NSICU) affiliated to Benha Specialized Pediatric Hospital. A convenient sample composed of all nurses working at NSICU and all neonates with TEF within six months from starting study. Data were collected using a structured questionnaire sheet to assess nurses' knowledge regarding quality of nursing care for neonates with TEF and observational checklists to assess nurses' performance for neonates with TEF at NSICU. The study results evident that three quarters of nurse shad average level of knowledge regarding neonates with TEF and all of them had good level of performance provided for neonates with TEF. Meanwhile, there were positive correlation between nurses' knowledge and performance scores. The present study concluded that, there were positive correlation between nurses' knowledge and performance scores in relation to their socio-demographic characteristics. It was recommended that periodical educational training programs for nurses working at NSICU are mandatory, for the purpose of updating the knowledge and to maintain efficient performance and to reach high quality of care.
**Key words:** Neonate-Tracheoesophageal Fistula-Quality of nursing care

## 1.   Introduction:

Neonatal period is a highly vulnerable time for an infant who is competing many of the physiologic adjustments required for extra uterine existence. The neonatal mortality rate reflects not only the quality of care available to women during pregnancy but also the quality of care available to infants during the first month of life*(World Health Organization [WHO],2009).*The leading causes of mortality rate during the first 4 weeks of life are prematurity and congenital malformation. Approximately 80% of neonates who die within 48 hours after birth are Very Low Birth Weight (VLBW) or Extremely Low Birth Weight (ELBW) *(Pillitteri, 2010).* The high neonatal morbidity and mortality rates represent two thirds of these deaths in neonatal period *(Behrman, et al, 2009).*

*Spear (2010)* defined High Risk Neonate (HRN)as any neonate at risk of sustaining medical, developmental or physiological problems. According to *Blackburn (2010)* any neonate who is susceptible to morbidity and mortality because of dysmaturity, immaturity, physical disorders or complications during or after birth are considered HRN. They require the collaborative efforts of a skilled multidisciplinary team including physicians, nurses, respiratory therapists, dietitians, and physical therapists (*Smith, et al, 2009).*

Tracheo Esophageal Fistula is an abnormal connection between the esophagus and the trachea. It is a congenital or acquired communication between the trachea and esophagus. TEF often lead to severe and fatal pulmonary complications**.** The incidence of congenital tracheoesophageal malformations in the U.S.A. is approximately 1 in 3,000 to 4,500 births. In some areas of the world as Finland, the incidence may be as high as 1 in 2,440 births. TEF and esophageal atresia affects males slightly more common than females 1, 26:1 *(Rebort, et al, 2009).* Babies with TEF and EA are often LBW; 20% of these babies are premature and another 20% are small for gestational age (*Egyptian Ministry of Health and population,   2010)*.

Although most cases of TEF anomalies are sporadic, familial patterns of inheritance are reported. About 6% of infants with tracheoesophageal malformations are twins. Parents with one affected child have a 0.5-2% chance of a tracheoesophageal anomaly affecting subsequent offspring. If more than one offspring is affected, the risk is 20%. Neonates with apparent history of TEF or esophageal atresia are affected 3-4% of the time (*Hollwarth, 2009).* Fetal Magnetic Resonance Imaging (MRI) has gained more attention for prenatal diagnosis of congenital anomalies, and postnatal presentation of newborns with TEF characterized by drooling of saliva, choking, coughing, and cyanotic attacks (*Wilson & Huckleberry, 2011).*

*Gabrielle, et al (2012)* indicated that total care in a high-risk population of esophageal atresia depends on the investigative modalities adopted, available neonatal intensive care, and the surgeon's experience. An attempt

continues to decrease the associated morbidity and mortality in HRN born with esophageal atresia and TEF.In addition, late presentation coupled with poor understanding of the milieu interior of the neonates by incompetent health care providers and poorly equipped hospitals combine to give rise to the unacceptable high morbidity and mortality in most parts of Africa. Proper training of all staff involved in neonatal health care coupled with community awareness must be vigorously pursued by all stakeholders (*Chirdanet al,2012).*

The concept of quality improvement is based on the philosophy that quality of healthcare can always be improved, so what is considered as an acceptable quality today may be substandard tomorrow, especially when considering modern advances such as diagnostic and treatment modalities, computers, and communication systems *(Alfaro, et al, 2009).*There is no one definition for quality, it is defined as "doing the right things right the first time" *(Janet & Brown, 2009).* In addition, quality of care is defined as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge"*(Institute ofMedicine, 2010).*

Quality improvement is the continuous study and improvement of the processes and outcomes of providing healthcare services to meet the need of patients, by examining the systems and processes of how care and services are delivered *(Ball &Bindler, 2008).* Quality improvement is a multidisciplinary approach to process change and a powerful tool for change and measurable improvement *(Daniels, et al, 2010).* Assessing and improving the quality of nursing care is a major focus of neonatal healthcare*(Lois & Bow sell, 2009).* Therefore, to improve the quality of neonatal nursing care and enhance the role of the nurse in providing quality services to neonates, nurses should undergo a series of lectures and practical training courses, which are developed and organized by members from senior nursing professionals. So, proper application of these services will contribute to improve the health and wellbeing of neonates *(Lefrak & Porter, 2009).*

Quality improvement is a major focus of neonatal health care. It aims at improving neonatal health care outcomes and related activities that contributes to neonatal care nurses, as the principal caregivers in any health care system, directly and profound affect the lives of patients and are critical to the quality of care patients receive*(National Quality Forum, 2011; McLaughlin & Kaluzny, 2011).*In addition quality improvement strategies are classified to six areas of performance could affect process and outcomes of health care as consistently providing appropriate and effective care, reducing unjustified geographic variation care, eliminating avoidable mistakes, lowering access barriers, improving responsiveness to clients, and eliminating racial/ ethnic ,gender, socioeconomic, and other disparities, and inequalities in access and treatment*(Leatherman & McCarthy, 2012).*

Furthermore, quality of health care is defined as delivering the best possible care and achieving the best possible outcomes for people every time they deal with the healthcare system or use its services. Essentially, it means doing the best possible job with the available resources. It is defined as meeting or exceeding the customers need and fulfilling his or her expectations. It is always the result of high intention, sincere efforts, intelligent direction and skillful execution, and it represents the wise choice of many alternatives *(Agency for Health Care Researcher and Quality, 2010).*Each nurse is accountable for her own quality of performance and is responsible for the use standards to ensure knowledge, safe and comprehensive nursing care *(American Nurses Association, 2009).*

Nurse's Role for neonates with TEF is to secure the replogle tube to prevent movement, nurse the infant in a head-up position to minimize the risk of aspiration pneumonia and the reflux of acid from the stomach through the fistula, place the replogle tube on continuous low pressure suction at 2-5cm H2o. Use the closed disposable suction system if available, to maintain patency of the replogle tube, flush with 0.5mls of normal saline every 15 minutes. Do not leave the syringe attached to the replogle as this will nullify the suction. Ensure the saline is aspirated back after each flush. Extra flushes may be required if the secretions are thick. Record all flushes on the observation chart, remove the replogle tube once every shift and flush thoroughly with saline into a paper cup to ensure optimal patency.  Replogle tubes are changed weekly unless otherwise indicated *(Carlisle & Stephenson, 2009).*

Neonates with TEF may return from theatre with a chest (wound) drain. This is not placed on suction unless specifically ordered by the surgeon, even low pressure suction may cause damage to the newly repaired esophagus, and the head of the bed should be elevated 30-45 degrees when the infant commences feeds. Post esophageal repair, infants may have some degree of esophageal dysmotility,  elevating the head of the bed, and utilizing positioning techniques may help to control reflux symptoms. The baby will continue to require frequent suctioning. Sometimes, even with a primary repair, a gastrostomy tube will be placed so that food can be given while sutures heal and the intestinal tract begins functioning again *(Children's Hospital of Wisconsin, 2013).*

## 2.  *Significance of the study*

Tracheoesophageal fistula is one of the most serious surgical emergencies in neonates, which require immediate diagnosis and correction. Neonates may be with other serious anomalies, such as congenital heart disease, imperforated anus, intestinal obstruction anal atresia. The incidence of these associations is around 20% in esophageal atresia population, but two or more anomalies occur in nearly half of patients. The incidence of TEF nationally was approximately 1 in 3,000 to 4,500 births with a slight preponderance of males in the ratio of 3:2. Most cases occur sporadically.  Incidence in Qalubia was in the last (5years) from 2005-2010 years were 200 cases and 40% of the cases were died. This finding from Benha children  hospital records. So the aim of the current study was to assess quality of nursing care given preoperative and post-operative for neonates with TEF, as well nurses' knowledge and performance regarding neonates with TEF to reduce mortality rate among neonates.

## 3.    Aim of the study

**This study aims to:**
- Assess the quality of nursing care provided for neonates with TEF.
- Assess nurses' knowledge and performance regarding neonates with TEF.

## 4.   Research questions:
1. Do nurses provide competent nursing care for neonates with TEF?
2. Do nurses have a satisfactory level of knowledge about TEF?
3. Are there relations between the nurses' socio-demographic characteristics and the quality of care provided for neonates with TEF?

## 5. Subjects and Methods

**5.1 Research design:**

A descriptive exploratory research design was utilized in the current study.

**5.2 Subject:**

1. A convenient sample of 60 neonatal nurses was participated in the current study.
2. All neonates (20) with TEF or esophageal atresia admitted in NSICU of Benha Specialized Pediatric Hospital within six months of data collection.

**5.3 Setting:-**

This study was conducted at the NSICU of Benha Specialized Pediatric Hospital.

**5.4 Tools of data collection:-**

Data were collected through using the following tools:

**A-  Questionnaire format sheets:** they were designed by the researchers after reviewing related literatures, it was written in Arabic language and composed of open and  closed ended questions to assess the following:

**Part (1):**

a. Socio-demographic data of the studied nurses that include age, gender, educational level, job, years of experience and attending previous training program, (Questions 1-7).
b. Socio-demographic characteristic of neonates with TEF include (gestational age, sex, and health condition on admission, weight, investigation and mode of ventilation), ( 12, Questions).

**Part (2):** Nurses' Knowledge regarding to TEF such as signs, symptoms, and care on admission, preoperative and postoperative care, as well as nurses' knowledge regarding quality of nursing care for neonates regarding to TEF (43, questions)

**B- Observational checklists:**

The observational checklists were adapted from the *Egyptian Ministry of Health and Population (2010), Ball and Bindler (2008) and Smith, et al., (2008).*Certain modifications were done by the researcher in the adapted checklists to suit the nature of the study. It was used to assess the quality of nursing care for the neonates regarding to TEF. It included the procedures of hand washing, vital signs, intravenous infusion, and collection of blood sampling, endotracheal tube insertion, suctioning, nursing care for neonates before, during, and after connection and weaning from mechanical ventilation, wound care, care of chest tube, feeding care and incubator care,

(all  observed items of performance were 27)

**Scoring system of nurses' knowledge and performance:-**

Scoring system for knowledge of the studied nurses was calculated as the following: the total number of questions was (43) questions and the total score of (86) was given for knowledge. Where (2) scores was given for completely correct answer, (1) for incompletely correct answer, and (0) for do not know.

Regarding nurses' performance of the studied nurses, the total scores of nurses' performance were 54 for all the nursing procedures carried out for the neonates regarding to TEF (27 items for the above mentioned procedures).The nurses' was performance classified into either completely done (2), incompletely done (1), and not done (0). According to the nurses' responses, their level of knowledge and performance was categorized as the following: good level (75 ≤ 100%);average level (60 < 75%) and poor level (<60%).

### 5.5 Validity and reliability
- Data collection tools were developed by the researchers after extensive review of related recent literature. Tools were submitted to a panel of five experts in the field of neonatal surgery and neonatal nursing to test the content validity. Modifications of the tools were done according to the panel judgment on clarity of sentences, appropriateness of content and sequence of items.
- Reliability test was done using Cronbach's test was done to be accepted reliability on ≤ .60

### 6    Pilot study :-
A pilot study was carried out, including six nurses to test the applicability and time consumed to filling the study tools. The necessary modification was done, and then nurses involved in the pilot study were included in the study, where no radical modification was carried out in the study tools.

### 7    Data collection procedure:
An official approval was obtained from hospitals' administrators of the study setting where a clear explanation was given about the nature, importance and expected outcomes of the study. The field work was carried out from the first of March 2012 to the end of August 2012(6-months). The researcher was available at the study setting by rotation, three days per week during morning, afternoon and night shifts. Each nurse was individually interviewed using the questionnaire sheet while their performance was assessed by using observational checklists during their actual care provided for neonates with TEF.  Each neonate was observed by the researcher and data was collected from the medical record. A consent was obtained orally from parents of neonates under the study, ensuring complete privacy and total confidentially.

### 8.    Statistical design:-
The collected data were organized, categorized, tabulated and analyzed using SPSS program version12. Numerical data were expressed as mean and standard deviation. Qualitative data were expressed as frequency and percentage. Chi-square was used to detect the difference between nurse's knowledge and performance. 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.

### 9.    Ethical consideration:-
Each studied nurse had the freedom to be involved in the study or to withdraw at any time. Parents of the studied neonates consent was obtained before data collection ensuring complete privacy and confidentially.

### 10. RESULTS
It was clear from table (1) that less than two thirds (65%) of the studied nurses' age were from 20-30 years with mean age of 22.8±0.52. The majority (80%) of the studied nurses were married. Apparently, the same table showed that, more than half (58.3%) of the studied nurses were graduate from diploma nursing school, meanwhile 46.6% of them were >5year of experience in caring of neonates with mean of experience was 5.25±1.89 year. However, the majority of the studied nurses (86.7%) had children and more than half (56.7%) of them attended training program.

Table (2) revealed that the distribution of neonatal characteristics whereas more than two thirds (70%) of the studied neonates were male and the rest of them were female. The vast majority of the neonates (85%) had gestational age from32-36 weeks, with mean of 33.75 ± 0.36 weeks and 80% of them had body weight from 2000-≤2500gm with mean 2000.26 ±41gm.Three quarters of the neonates were delivered by cesarean section., more than half (55%) of them on oxygen therapy through ventilator and 30% through nasal cannula. However, three quarters (75%) of the neonates had chest tube after operation and vast majority (90%) of them take sedatives.

Table (3) revealed that, half of studied nurses recorded complete answer about definition of TEF and defects, while vast majority (90%)gave complete answer about causes of TEF and more than one third(35%)

reported complete answer about types of TEF. However, the majority of studied nurses(88.3%) had incomplete answer about signs and symptoms of TEF.

As regards to knowledge of the studied nurses about preoperative care, it was found that the majority (86.7%) had complete answers related to preoperative investigation, more than two thirds (70%) completely identify the symptoms indicated the need for cardiopulmonary resuscitation. Half of studied nurses had complete answer about vital signs pre and postoperative care. More than two thirds (68.7%) of them had complete answer about care during stopping of respiration among neonates with TEF.

It was clear from table(4)that, all studied nurses (100%) gave complete answer related to care of endotracheal tube and care during arterial blood gasses(ABGs) sample, Almost of them (95%,96.7%&98.0% respectively) had complete answers related to nursing care of neonate on mechanical ventilator, input/output and ryle feeding after operation. The vast majority (93.3%) of them reported complete answers related to signs of endotracheal tube displacement and emergency equipment beside the neonate. While almost (98.3%)of them had complete answers related to measuring input/output, while more than three quarters (78.3%) of them recorded complete answers related to care of chest tube.

Table (5) proved that, all of the studied nurses reported that they used new catheter every time when provide suctioning for neonates with TEF. Most of them (96.6%) identified the difference between size of suction catheters for mouth and nasal suctioning. Most of the nurses (96.6%& 95.0%) had correct answer related to suitable time of suction and cyanosis during suction process respectively. The majority (83.3%& 81.7%) of studied nurses chosen correct answer related to percussion to prevent cyanosis (pre and postoperative) suction process and period of suction process and prevention of cyanosis. The study's results revealed that the majority (81.7%) of the studied nurses had incorrect knowledge in relation to the concept of quality in health care and concept of quality NSICU. There was statistically significant difference in all items (p<0.05).

Table (6) revealed that, all of studied nurses (100%) had correctly done performance related to vital signs, nursing care before connecting the neonates to mechanical ventilation, record and report of tube feeding and chest tube insertion respectively, While the lowest percentage was 6.7%had incorrectly done performance related to incubator care. The study's results revealed that, all of studied nurses (100%) had average level of performance regarding neonates with TEF, while three quarters of them (75%) had an average level of knowledge **(Figure, 1)**

Table (7) indicated that, there were statistical positive correlation between nurses' age and their knowledge about TEF (p<0.05).Table (9) illustrated that, there were positive correlation between nurses' knowledge and performance scores. The study results revealed that, there are negative correlation between total nurses' knowledge and performance regarding to TEF (p>0.05).

**Table (1) Percentage distribution of nurses' according to their sociodemographic data (N=60)**

| Items | NO | % |
|---|---|---|
| **-Age:** | | |
| -<20 | 2 | 3.30 |
| -20-<30 | 39 | 65.0 |
| ->30 | 19 | 31.7 |
| Mean ±SD | 22.8±0.52 | |
| **-Marital status:** | | |
| -Single | 9 | 15.o |
| -Married | 48 | 80.0 |
| -Divorced | 3 | 5.0 |
| **-Have children:** | | |
| -Yes | 52 | 86.7 |
| -No | 8 | 13.3 |
| **-Educational level:** | | |
| -Secondary School of  Nursing | 35 | 58.3 |
| -Technical Institute of Nursing | 6 | 10.0 |
| -Bachelor's Degree in Nursing | 19 | 31.7 |
| **-Years of experience:** | | |
| -<5 | 19 | 31.7 |
| -5 | 13 | 21.7 |
| ->5 | 28 | 46.6 |
| Mean± SD | 5.25±1.89 | |
| **-Attending of training programs.** | | |
| -Yes | 34 | 56.7 |
| -No | 26 | 43.3 |

**Table (2) Percentage Distribution of characteristic of neonates (N=20)**

| Item | NO | % |
|---|---|---|
| **-Gender:** | | |
| -Male | 14 | 70.0 |
| -Female | 6 | 30.0 |
| **-Gestational age:** | | |
| -<28 weeks | 0 | 0.0 |
| -28-<32weeks | 3 | 15.0 |
| -32-<36 weeks | 17 | 85.0 |
| -36-≤40 weeks | 0 | 0.0 |
| Mean ±SD | 33.75 ± 0.36 | |
| **-Weight:** | | |
| -<1000g | 0 | 0.0 |
| -1000g-<1500g | 0 | 0.0 |
| -1500g-<2000g | 4 | 20.0 |
| -2000g-≤2500g | 16 | 80.0 |
| Mean ±SD | 2000.26±0.41 | |
| **-Type of delivery:** | | |
| -S.C | 15 | 75.0 |
| - Normal vaginal delivery (NVD) | 5 | 25.0 |
| *Oxygen method; | | |
| -Nasal | 6 | 30.0 |
| -Ventilator | 11 | 55.0 |
| -Mask | 3 | 15.0 |
| **-Type of investigation at preoperative period:** | | |
| -Routinely | 60 | 100.0 |
| -Other investigation | 0 | 0.0 |
| **-The neonatal discharge from operation with chest tube:** | | |
| -Yes | 15 | 75.0 |
| -NO | 5 | 25.0 |
| **-Sedative after operation:** | | |
| -Yes | 18 | 90.0 |
| -No | 2 | 10.0 |

**Table (3) Percentage distribution of nurses, knowledge about TEF (N= 60)**

| Item | NO | % |
|---|---|---|
| **-Definition:** | | |
| -Complete answer | 30 | 50.0 |
| -Incomplete answer | 30 | 50.0 |
| -Don,t know | 0 | 0.0 |
| **-Causes:** | | |
| -Complete answer | 54 | 90.0 |
| -Incomplete answer | 6 | 10.0 |
| -Don,t know | 0 | 0.0 |
| **-Signs and symptoms:** | | |
| -Complete answer | 7 | 11.7 |
| -Incomplete answer | 53 | 88.3 |
| -Don,t know | 0 | 0.0 |
| **-Types:** | | |
| -Complete answer | 21 | 35.0 |
| -Incomplete answer | 39 | 65.0 |
| -Don,t know | 0 | 0.0 |

**Table (4) Percentage distribution of nurses, knowledge about postoperative care of TEF (N=60)**

| Items | NO | % |
|---|---|---|
| **-N C. of neonate with M.C.V:** | | |
| -Complete answer | 57 | 95.0 |
| -Incomplete answer | 3 | 5.0 |
| -Don't known | 0 | 0.00 |
| **-N C of end tracheal tube:** | | |
| -Complete answer | 60 | 100.0 |
| -Incomplete answer | 0 | 00.0 |
| -Don't known | 0 | 0.00 |
| **-Signs of E.T.T displacement:** | | |
| -Complete answer | 56 | 93.3 |
| -Incomplete answer | 4 | 6.7 |
| -Don't known | 0 | 0.00 |
| **-ABG for neonate with M.C.V:** | | |
| -Yes | 16 | 26.7 |
| -NO | 44 | 73.3 |
| -Don't known | 0 | 0.00 |
| *Anticoagulant for ABG: | | |
| Correct answer | 60 | 100.0 |
| Incorrect answer | 0 | 0.0 |
| Don't known | 0 | 0.00 |
| **-Bubbles in ABG sample:** | | |
| -Yes | 60 | 100.0 |
| -NO | 0 | 0.0 |
| -Don't known | 0 | 0.00 |
| **-Emergency equipment:** | | |
| -Complete answer | 56 | 93.3 |
| -Incomplete answer | 4 | 6.7 |
| -Don't known | 0 | 0.00 |
| **NC for chest tube:** | | |
| -Complete answer | 47 | 78.3 |
| -Incomplete answer | 13 | 21.7 |
| -Don't known | 0 | 0.00 |
| **-Position:** | | |
| -Correct answer | 45 | 75.0 |
| -Incorrect answer | 15 | 25.0 |
| -Don't known | 0 | 0.00 |
| **Input/output chart:** | | |
| -Yes | 59 | 98.0 |
| -NO | 1 | 1.7 |
| -Don't known | 0 | 0.00 |
| | | |
| **-Sedative after operation:** | | |
| -Correct answer | 40 | 66.7 |
| -Incorrect answer | 20 | 33.3 |
| -Don't known | 0 | 0.00 |
| **-Ryle feeding after operation:** | | |
| -Correct answer | 58 | 96.7 |
| -Incorrect answer | 2 | 3.3 |
| -Don't known | 0 | 0.00 |

**Table (5) Number and percentage distribution of nurses' knowledge about care of suctioning (N=60)**

| Item | NO | % |
|---|---|---|
| **-Difference between size of suction catheter (mouth &  nose):** | | |
| -Yes | 40 | 66.7 |
| -NO | 17 | 28.3 |
| -Don't known | 3 | 5.0 |
| **-Suitable time of suctioning:** | | |



Nurses' Knowledge and  Performancer Regarding Neonates with TEF
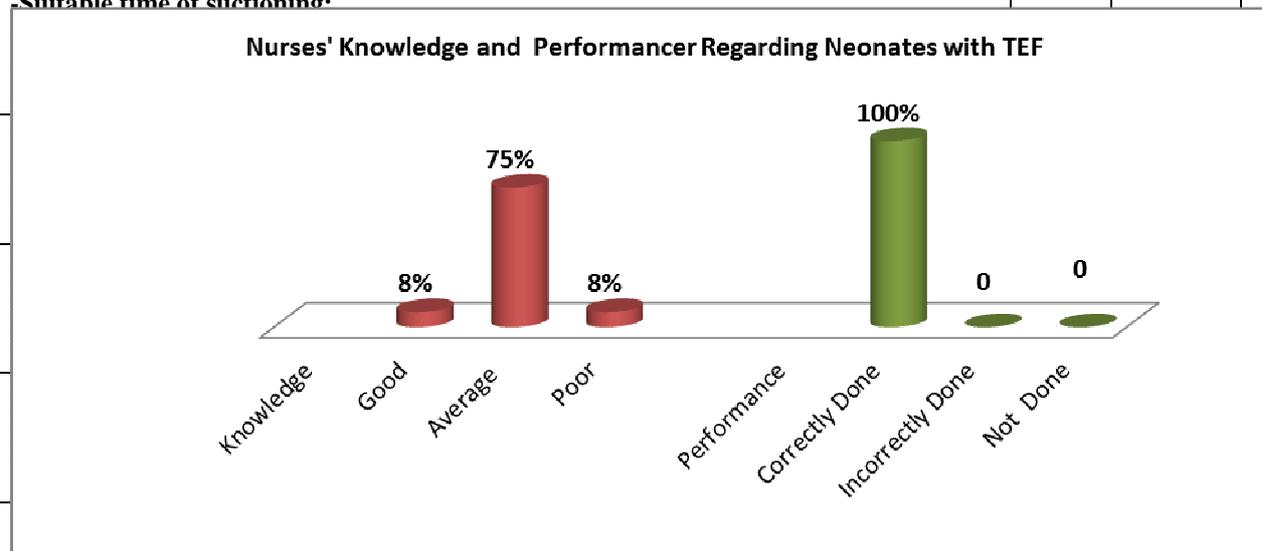
**Figure (1)**

**Table (6) Percentage distribution of observed nurses' performance provided for neonates with TEF (N=60)**

| Items | Correctly done | | Incorrectly done | | Not done | |
|---|---|---|---|---|---|---|
| | NO | % | NO | % | NO | % |
| **1-Hand washing:** | 57 | 95.0 | 3 | 5.0 | 0 | 0.0 |
| **2-Vital signs:** | | | | | | |
| -Axillary temperature | 60 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| -Heart rate | 60 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| -Respiratory rate | 60 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| **3-Care of intravenous infusion:** | 59 | 98.3 | 1 | 1.7 | 0 | 0.0 |
| **4-Collection of blood sample:** | | | | | | |
| - Venipuncture | 57 | 95.0 | 3 | 5.0 | 0 | 0.0 |
| -ABGs  sample | 59 | 98.3 | 1 | 1.7 | 0 | 0.0 |
| **5-Endotracheal tube insertion:** | 59 | 98.3 | 1 | 1.7 | 0 | 0.0 |
| **6-Suctioning before connecting the neonate to MV:** | | | | | | |
| -Nasal /oral suctioning | 57 | 95.0 | 3 | 5.0 | 0 | 0.0 |
| -ETT suctioning | 59 | 98.0 | 1 | 1.7 | 0 | 0.0 |
| **7-Nursing care:** | | | | | | |
| -Nursing care before connecting the neonate to MV | 60 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| -Nursing care during connecting the neonate to MV | 59 | 98.3 | 1 | 1.7 | 0 | 0.0 |
| -Nursing care after connecting the neonate to MV | 59 | 98.3 | 1 | 1.7 | 0 | 0.0 |
| **8-Wound care:** | 56 | 93.3 | 4 | 6.7 | 0 | 0.0 |
| **9-Tube feeding:** | | | | | | |
| -After insertion check the position of tube | 55 | 91.7 | 5 | 8.3 | 0 | 0.0 |
| -Oral feeding(bottle) | 47 | 78.3 | 6 | 10.0 | 7 | 11.7 |
| -Record and report | 60 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| **10-Chest tube:** | | | | | | |
| -Insertion | 60 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| -Removal | 42 | 0.0 | 15 | 25.0 | 3 | 5.0 |

**Table (7) Correlation between nurses, characteristics and their knowledge about TEF (N=60)**

| Sociodemographic data | Total knowledge | |
|---|---|---|
| | r | p |
| Age | 0.30 | <0.05 |
| Marital status | 00.22 | >0.05 |
| Having child | 0.13 | >0.05 |
| Year of experience | 0.12 | >0.05 |
| Level of education | 0.10 | >0.05 |
| Training attendance | 0.15 | >0.05 |
| Benefit of training | 0.08 | >0.05 |

**Table (8) Correlation between total nurses, knowledge and performance in relation to their socio-demographic characteristics (n=60).**

| Variables | Knowledge | | Performance | |
|---|---|---|---|---|
| | r | P value | R | P value |
| - Age | 0.30 | 0.01 | 0.24 | 0.06 |
| -Level of education | 0.10 | 0.44 | 0.12 | 0.34 |
| - Marital status | 0.15 | 0.24 | 0.17 | 0.18 |
| -Experience | 0.12 | 0.34 | 0.06 | 0.17 |
| -Training | 0.02 | 0.86 | 0.12 | 0.33 |

Significant at <0.05

## 11. Discussion

Regarding socio-demographic data of the studied nurses, the results of the current study showed that, less than two thirds of the nurses' age was between 20-<30years with mean age of 22.8±0.52 year, this result was similar to result of a study by *Mustafa (2007)* about quality of nurses' performance in neonatal intensive care units, who found that the age group of nurses were between 20-<25 years. This result might reflect that the age of NSICU in Benha is to some extent a new field of pediatric nursing subspecialties.

As regard the years of experiences of the studied nurses, the findings of the current study showed that, less than half of them had >5 years of experiences in NSICU with a mean years of experiences 5.25±1.89years, this finding was similar to the finding of *Kunswa (2010)* about needs, problems and nursing care of newborn infant, who found that the majority of studied nurses had years of experience ranged from 5-10 years with mean 5.5±3.01years.

The current study revealed that, more than half of nurses had secondary school nursing diploma, this may be due to the fact that nursing secondary school provide the community with large number of diploma nurses graduates than other agencies such as faculties of nursing and technical institutesof nursing, these findings were similar to the finding of *Ismail and Abd-ElFattah (2008)*about nurses pitfalls in intensive care unit: effect of intervention educational program, who indicated that two thirds of nurses had nursing diploma with mean age 23,8±3.8 years.

The current study's results showed that, less than half of the nurses not attending any training courses, these finding supported by *Mustafa (2007)*who found that, the majority of nurses not attending training courses in NICU and this might affect nurses' level of knowledge and performance. According to *Carol (2009)*the formal training courses plays an important role in enhancing and updating nurses' knowledge and performance beside improving the quality of care given to neonates with TEF, regarding the nurses, attendance training courses for caring of neonates in NSICU. The training programs play an important role in enhancing and updating the nurses' knowledge and practice, besides improving quality of care given to the neonate. The researcher believes that attending training programs by nurses especially in the NICU is crucial to provide quality of nursing care.

Regarding to characteristics of neonates with TEF, the current study found that, the mean of gestational age were 33.75 ± 0.36 weeks and mean of weight on admission were 2000.26 0±0.41grams, this mean weight could be appropriate to their gestational age according to our experiences. Regarding to gender of the studied neonates, the results of the present study showed that, more than two thirds of them were males; this finding was similar to results of *Amin (2009)* about intervention of nursing program for care of high risk neonates, who found that, more than half of neonates (59.3%) were males. This is also assured the idea that the incidence of congenital anomalies is higher in male than female.

Regarding to the type of delivery of the studied neonates it was found that TEF more increased with cesarean section (CS) delivery, the current study viewed that, three quarters of the studied neonates were delivered by C.S. on the other hand, it is known that fetus's respiratory function can be depressed if the mother is given general anesthesia because it make difficult for neonate to take his first breath. In the same field, *Kunswa (2010) and Mohammed (2010)* concluded that, more than half of neonates delivered by CS.

Regarding nurses' knowledge about TEF, the finding of the present study showed that half of the studied nurses gave incomplete answers about definition of TEF. While a vast majority had complete answer about causes of TEF, less than two thirds of the nurses had incomplete answers about types of TEF, this finding was agreed with *Hassan (2010)* who found that, the majority of nurses had poor level of knowledge about signs and symptoms of TEF.

As regards the nurses' knowledge about suctioning, the current study viewed that, almost all of the studied nurses reported complete answer about suctioning of neonates with TEF, this finding was dissimilar to *Abd - Elmonem, ( 2008)* about nursing care for neonates undergoing noninvasive continuous positive airway pressure, who found that more than quarter of nurses had poor level of knowledge related to suctioning, the finding disagreed with *(Amin, 2009)* who found that, all of studied nurses gave poor level of knowledge regarding suctioning. The finding of our study was near similar to *Mohammed, (2010)* who found that the minority (20%) of the nurses had good knowledge related to suctioning.

On assessing nurses' knowledge regarding to post-operative nursing care of neonates with TEF, the finding of the current study showed that, the majority of studied nurses gave complete answer about knowledge of ventilator care. More than two thirds of the studied nurses had incomplete answer about knowledge of TEF, this finding was disagreed with *Eid (2005)* who concluded that nurses' knowledge regarding to post-operative nursing care was barrier to perform satisfactory immediate postoperative care.

As regard the nurses' knowledge related to analysis of arterial blood gases, the finding of the current study showed that, nearly three quarters of the studied nurses didn't had knowledge in this important investigation for neonates with TEF, this finding was in the same way with *Abd-Elgalil (2007)* who found that, only 9 of the nurses achieved the desired level regarding capillary blood sample.

As regards the quality of nursing care provided by the nurse regarding ventilation and their role in caring of neonates with TEF, the finding of the current study showed that, almost all of the studied nurses had good level. This finding not supported by, *Zein El-Abedein (2010)* and *Mohammed (2010)* who found that, very few of the nurses (13.3%-10%, respectively) gave good score level regarding the total nurses' knowledge about the role of the nurse after weaning the neonates from mechanical ventilation.

By assessing nurses' knowledge related to infection control in NSICU, the finding of present study viewed that, most of the studied nurses had good level of knowledge, this finding dissimilar with *Abd-Elmonem (2008)* who found that, one third of nurses had good level and rest of the nurses had poor score level, this may due to lack of supervision and lacking of attendance training courses about infection control at NSICU. From the researchers' point of view sometimes the shortage in supplies and facilities to adapt infection control measures lead to inadequacy in nursing care in this aspect.

As regards the nurses' knowledge related to the concept of quality in health care, the current study revealed that, the majority of the studied nurses had incorrect knowledge. This finding similar to *Mustafa (2007)* who found that, only one quarter of the nurses had correct score level of knowledge about the concept of quality. This may be due to the lack of the nurses' knowledge about quality and its importance in care of critically ill neonates.

As regards the nurses' knowledge related to the nurses' role for promoting quality of care level at NSICU, the current study assured that, more than half of the studied nurses had correct knowledge regarding to promoting quality of care level at NSICU. This finding was disagree with *Mustafa (2007),* who found that, more than one third (38%) of the studied nurses had correct score level of knowledge related to role of nurses for elevation of quality level at NICU.

On assessing nurses performance regarding the measurement of vital signs, the current study clarified that, all nurses had good performance, this finding wasdissimilar with the study done by *El-Sayed (2007)* about effect of in service educational program for nurses of pediatric intensive care unit about care of critically ill children, who found that 26.0% had good performance ,where the importance of vital signs cannot be ignored as it is a basic nursing activity in the child assessment which should precede nursing care planning and implementation. In addition this finding was agreed with *Mustafa (2007)* who found that, no one of the nurses had poor performance in vital signs, so it is a basic procedure in the assessment of the neonate.

Regarding the nurses' performance of hand washing, the present study showed that, almost all nurses had good performance of hand washing, where this is routine procedure especially in neonatal units. This finding

was disagreed with *Abo-zaid ( 2008)* who found that, this might be due to hand washing was not followed routinely in the most of the nursing procedures due to insufficient or lack of training and knowledge about measures of infection control at NICU and improper application of infection control standards at NICU. In the same approach,*Fathy (2011)* indicated that hand washing was the most single effective procedure a nurse could perform to reduce spread of infection and should be performed before and after each nursing procedure.

As regards the nurses' performance related to wound care, almost all of them reported good performance; this finding is incontrary to *Morsy (2008)* who found that, two thirds of nurses had poor performance related to wound care. On other hand*, Carol (2012)* mentioned that, surgery requires strict attention to aseptic technique use of sterile materials and through disinfection of the skin around the operative site.

As regards quality of nursing care provided by the nurse before connecting the neonates to mechanical ventilation, the present study illustrated that, almost all of the studied nurses had good level of performance. On the other hand,*Zein El-Abedein (2010)* found that, very few (4.3%) of the nurses had good level of performance and more than three quarters (76.7%) of the nurses were not aware of all steps of preparation of ventilator.

In total assessment of nurses knowledge regarding to TEF, the findings of the current study showed that, the highest percentage of the studied nurses had average level of knowledge. This finding dissimilar with *Abo-zaid (2008)* who studied the quality of nursing care for high risk neonates receiving total parental nutrition , who found that, more than two thirds (67.5%) of nurses had average level of knowledge ,and this disagreed with *Hassan(2010)* who found that, the majority of nurses had poor level, and half of them had unsatisfactory level of knowledge.

In relation to quality of nursing care for neonates with TEF, the present study showed that, all of the studied nurses had good performance of hand washing, this finding was disagreedwith *(Abo-zaid, 2008)* who indicated that, this might be due to hand washing was not followed routinely in most of the nursing procedures due to insufficient or lack of training and knowledge about measures of infection control at NICU and NSICU, and improper application of infection control standards at NICU. In addition, *Fathy (2011)* revealed that hand washing was the most single effective procedure a nurse could perform to reduce spread of infection and should be performed before and after each nursing procedure.

In studying the relations between nurses knowledge and their age, the findings of the present study viewed that, there was statistical significant relation between nurses' level of knowledge and their age. Less than half of the nurses had an average level of knowledge regarding to neonates with TEF and this finding was significantly to nurses' years of experience (p<0.05) this finding agreed with *Abd-Elmoem (2008)* who found that the majority of nurses had poor knowledge in relation to nurses with age between 20-<25 year, and years of experience between 5-10 years. According to *Hyett (2009)*who suggested that, staffs in more senior posts are supposed to have more knowledge and skills than those in more junior posts due to greater experience.

Regarding the relationship between nurses performance and their age, the finding of the current study viewed that there was statistically significant relation between nurses 'level of performance and their age (p<0.05). This result was in agreement with *Leodoro (2012)* who evaluatednurses knowledge and performance of pre and post-operative care, and found that, there was no statistical significance relation between nurses performance and knowledge.Regarding the relation between nurses performance and their age, the finding of the present study viewed that,there was statistically significant relation between nurses performance and their age (p<0.05). This result was in agreement with *Leodoro (2012)* who evaluatenurses knowledge and performance of pre and post-operative care, and found that, there was no statistical significance between nurses performance and knowledge.

The present study showed that, there was no statistically significant relation between nurses' knowledge and level of education (p>0.05), this finding supported by *Mohamed (2010)* who found that there were no statistical significant relationship between nurses' knowledge and their level of education. Regarding to relationship between nurses' knowledge and year of experiences, the present study showed that, there was no statistical significant relation between nurses' knowledge and experiences (p>0.05). This finding disagreed by *Abd-Elgalil (2009)* who found that, there was Statistical significant relation between nurses' knowledge and experiences.

Regarding to relationship between nurses' performance and year of experiences, the current study showed that, there was statistical significant relation between nurses' performance and years of experience (p<0.05). Actually, years of experience enable them to master skills competently.

## 12. Conclusion

The study concluded that more than half of the studied nurses were graduate from diploma nursing school, It can be concluded also from the current study that, there were average level of the nurses' knowledge related to tracheoesophageal fistula and, the quality of nursing performance for neonates with tracheoesophageal

fistula at NSICU was good. Actually observed nursing performance given to neonate with TEF in pre and post-operative periods, can enable nurses provide comprehensive care for those neonates. There were positive correlation between nurses' knowledge and age. There are negative correlation between total nurses' knowledge and performance regarding to TEF.

## 13. *Recommendations*

Based on results of the present study, the following recommendations can be suggested:-

- Periodical educational program for nurses working at NSICU is mandatory, for the purpose of raising and updating the knowledge of nurses.
- Raising the nurses' awareness about quality of nursing care and its application in care for neonates with tracheoesophageal fistula.
- Provide procedure manual handbooks containing all necessary information (knowledge) about nursing procedures related to quality of nursing care for neonates with tracheoesophageal fistula.
- Neonatal surgical intensive care unit should be equipped with both human and non-human resources to enable neonatal nurses providing high quality of care for neonates with TEF.

## 14. Acknowledgement

## 15. References

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