Assessment of Nurses' Performance Regarding Care of Neonates having Tracheoesophageal Fistula

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Abstract

Background: Tracheoesophageal fistula is one of the most serious congenital anomalies among neonates and associated with high morbidity and mortality rates so it is require competent and skillful pre & post –operative care. **Aim:** This study aimed to assess nurses' performance regarding care of neonates having tracheoesophageal fistula. **Research design:** A descriptive research design was employed to fulfill the aim of the current study and answered the research question. **Setting:** This study was conducted at Neonatal intensive care units in children hospital affiliated to Ain Shams University and Sohag University Hospital. **Sample:** A convenience sample of 70 nurses who were working in the previously mentioned setting. **Tools of data collection:** A) predesigned questionnaire format. B) Observation check list. **Results:** Only fifth of the studied nurses had a good level of knowledge and more than two fifths of them had a competent practices regarding care of neonates having tracheoesophageal fistula. **Conclusion:** More than two fifths of the studied nurses had a poor level of knowledge and more than half of them had incompetent level of practices regarding care of neonates having tracheoesophageal fistula and also, there were a statistical significant relation and positive correlation between total nurses' characteristics and their practices**. Recommendations:** Periodic assessment of knowledge and practices of all nurses dealing or providing care of neonates having tracheoesophageal fistula. Emphasize the importance of continuous training on appropriate nursing intervention which should be designed according to actual needs of neonates having tracheoesophageal fistula.

Key words: Nurses Performance, Neonatal, Tracheoesophageal Fistula.

Introduction

Tracheoesophageal fistula (TEF) is one of the most common neonatal surgical emergencies and most common digestive tract malformation due to the faulty separation of embryonic foregut into trachea and esophagus at 5th to 6th embryonic weeks. If this malformation not managed appropriately, it will cause a serious complications and may lead to death ***(Kassif et al., 2021).***

Tracheoesophageal fistula is an abnormal connection between the trachea and the esophagus due to failed fusion of the tracheoesophageal ridges after the fourth week of the embryological development Neonates with TEF or esophageal atresia are unable to feed properly, so once they diagnosed, prompt surgery is required to allow the food intake and maintain health status ***(Scott et al., 2018).***

Neonates with TEF may be with other serious anomalies such as congenital heart disease, imperforated anus, intestinal obstruction or anal atresia. Congenital TEF may be associated with serious complication such as recurrent pneumonia, acute lung injury, acute respiratory distress syndrome, lung abscess, poor nutrition, bronchiectasis from recurrent aspiration, respiratory failure and death ***(Gürsoy et al., 2021).***

The world prevalence of TEF malformation is 2 to 2.4 per 10,000 live births and the incidence in the United States of America (U.S.A) is approximately 1:3000 – 4500 of live births. In some areas of the world as Finland, the incidence may be as high as 1 in 2,440 births ***(Kharadi et al., 2021).***

There are some environmental factors that have been thought causing TEF or EA which include the use of methimazole (tapazole) in early pregnancy

which used in treatment of hyperthyriodism, prolonged use of contraceptive pills, maternal diabetes, thalidomide exposure, advanced maternal age, european ethnicity, obesity, low socioeconomic status and tobacco smoking ***(Kumari et al., 2018).***

The most common presentation that detected antenatally is being polyhydramnios and after birth the signs includes; excessive salivation, drooling, vomiting, respiratory distress and recurrent pneumonia later in life. These signs of TEF or esophageal atresia are usually noted very soon after birth ***(Dwyer et al., 2016).***

The mortality from TEF malformation isn't related to the surgery itself but due to severity of complication. As many complications may occur such as anastomotic leak, esophageal stricture, tracheomalacia, gastroesophageal reflux disease, repeated chest infection and aspiration, may lead to long term respiratory sequale include obstructive and restrictive ventilatory defect and hyper-reactive airway ***(Zani et al., 2018).***

Prenatal detection of EA by ultrasonography relies on the finding of a small or absent stomach bubble and associated maternal polyhydramnios. ***(He et al., 2022).*** A recent report suggests that real-time fetal magnetic resonance imaging may be useful in the prenatal & post natal diagnosis of esophageal atresia anomalies suspected on ultrasound. Most neonates with esophageal atresia are symptomatic in the first few hours of life. The earliest clinical sign of esophageal atresia is usually excessive salivation that results from pooling of secretions in the pharynx ***(Sheng et al., 2022)***.

Treatment of TEF is done through surgical correction of the malformation, it may associated with complications including stricture due to gastric acid erosion of the shortened esophagus, leak of contents at the point of anastomosis, recurrence of fistula and increased gastro esophageal reflux ***(Kassif et al., 2021).***

Nurses have an important role in early detection of the TEF malformation through the presence of signs immediately after birth the major concern is to establish a patent airway and to prevent further respiratory compromise. The pre & post-operative nursing management of the neonates are vital (***Ellinas, 2017).***

Significance of the study:

Tracheoesophageal fistula (TEF) is one of the most serious pediatric surgical emergencies in neonates, which require early diagnosis and immediate correction of the malformation. The world prevalence of the disorder is 2 to 2.4 per 10,000 live births, in the U.S.A. is approximately 1 in 3,000 to 4,500 births ***(Kharadi et al., 2021).***

In some areas in Egypt such as Children Hospital in the last 3 years from (2018: 2021) it was approximately 150 cases ***(Ain Shams Statistical Records, 2022)*** and also in Sohag in the last 3 years from (2018: 2021) it was approximately 100 cases ***(Sohag Statistical Records., 2022).*** If this defect not managed correctly and appropriately this will affect the neonate latterly in life or may result in a serious deterioration and may cause death ***(Abd – Elhamed et al., 2016).***

The pediatric nurse has an important role as: helping care giver to adjust to neonate's condition, reducing anxiety about malformation, surgery and the treatment planning for home care, as a counselor, help care giver to realize his / her abilities and strengths, identify problem and stresses, develop problem solving strategies and identify new coping strategies ***(Boughdir et al., 2022).*** From here the researcher shed light on the importance of pediatric nurses' performance toward care of neonates having tracheoesophageal fistula

Aim of the study

This study aims to assess nurses' performance regarding care of neonates with TEF.

Subjects and Methods

The study was portrayed under the four main designs as following:

I-Technical Design: The technical design includes: research design, setting, study subject, and tools of data collection.

1- Research design:

A descriptive research design was employed to fulfill the aim of the current study and answer the research question.

2- Research Settings:

This study was conducted at Neonatal Intensive Care Units in children hospital affiliated to Ain Shams University and Sohag University Hospital.

3- Study subjects:

A convinence sample composed of all available nurses N=70 who were working in morning and afternoon shifts.

A purposive sample composed of 20 neonates who having TEF in the previously mentioned settings throughout the period of data collection.

4- Tools of data collection:

Data were collected through using the following tools:

1- Pre-designed Questionnaire Format:

It was designed by the researcher after reviewing the recent and relevant literature **Ahmed et al., (2016) & Abd- Elhamed et al., (2016)** and reviewed by the supervisors. It was written in a simple Arabic language, in the form of closed and open ended questions. It included the following two parts.

Part I: it was concerned with:

a. Characteristics of studied nurses as regard their age, gender, qualifications, marital status, years of experience and attendance of training courses.

b. Characteristics of studied neonates as regard their chronological age, gestational age, gender, health condition on admission, weight, length, diagnosis, and type of delivery, investigation, mode of ventilation, prognosis and hospital stay.

Part II: Nurses' knowledge regarding care of neonates having TEF which included 54 questions in the form of closed ended and open ended questions in the form of 52 closed ended questions and 2 open ended questions. The questions about anatomy & physiology of the trachea (6 questions), anatomy & physiology of the esophagus (6 questions), TEF (definition, causes, signs, diagnosis & management) (9questions), nursing intervention at neonatal intensive care unit (5 questions), mechanical ventilation (14 question), oxygen therapy & nebulizer (5 questions) and health teaching to parents regarding TEF (9 questions).

❖ **Knowledge Scoring System:**

The nurses' answers were cross-checked with a model key answer prepared by the researcher. A correct answer was scored "1", while a "0" was given for an incorrect answer or un known. Total score of studied nurses' knowledge was "54 grades" these grades were converted into percentage which equal 100%. Afterwards, the studied nurses' total knowledge was classified into:

- Good knowledge (≥75%) which equal in grades more than 39.
- Average knowledge (60% < 75%) which equal in grades (31 > 39).
- Poor knowledge (< 60%) which equal in grades less than 31.

2- Observational Checklists:

It was adapted from ***Hockenberry and Wilson (2015), Kalia., (2015) and Pamela, et al., (2011)*** it used to assess actual nursing practices at NICU related to TEF conditions such as performing hand washing (11steps), assisting in endotracheal tube insertions (13 steps), endotracheal tube suction (18 steps), oral and naso-pharyngeal suction (18 steps), connecting cardiac monitor (11 steps), measuring central venous pressure (12 steps), care of under water –seal drainage (11 steps), care of drains (28 steps), measuring vital signs: axillary temperature (14 steps), apical pulse (10 steps),

respiratory rate (9 steps), intravenous therapy: cannula connection (15 steps), IV infusion (13 steps), follow up chart for IV line (7 steps), Nursing Care before, during and after Connection of Mechanical Ventilation (MV): Care before connection of MV (7 steps), care during connection of MV (9 steps), care after connection of MV(7 steps), gastrostomy feeding (18 steps), gastrostomy care (12 steps) routine care at neonatal intensive care unit including, mouth care (9 steps), positioning in semi setting position (8 steps), O_2 therapy: O_2 therapy through O_2 mask (10 steps) O_2 therapy through nasal cannula (10 steps), incubator care (15 steps), eye care(14 steps), diaper care (19 steps), preoperative care (11 steps) & post-operative care (10 steps).

Tool	Cronbach's Alpha
Pre-designed Questionnaire Format	0.823
Observational checklist	0.870
Total tool	0.850

❖ **Practices Scoring System:**

For scoring "1" grade was given for correctly done step, while "0" was given for incorrectly done or not done step with total score "349" grades these grades were converted into percentage which equal 100% and according to the score of total practice was categorized into two levels:

- Competent level (≥ 90 %) which equal in grades ≥ 314.
- Incompetent level (< 90%) which equal in grades < 314.

II- Operational Design:

The operational design of this study included preparatory phase, validity and reliability of the developed tool, pilot study, filed work, ethical considerations.

A. Preparatory phase:

It included reviewing the recent and relevant literature covering various aspects of the study problem using textbooks, articles, periodicals, magazines and internet searching in order to get acquainted with various aspects of the research problem and to develop the study tools for data collection.

Validity and Reliability:

Validity:

The developed study tools were tested and evaluated for comprehensiveness, accuracy, clarity and relevance by a group of 3experts (professors & assistant professors) in pediatric nursing to gain their experiences and opinion's regarding the tools contents while a minor modification was done accordingly in the form of omission or addition of some questions or rephrasing for some statements

Reliability:

- Reliability analysis by measuring of internal consistency of the tool through Cronbach's Alpha test.

B. Pilot Study:

A Pilot study was done on 10% of the total sample size (n=7) to test the clarity and applicability of tools and determine the needed time for each tool. After analyzing results of a pilot study, the necessary modifications were done. The modification consists in classifying question into three forms to suit the scoring system. Finally the nurses involved in the pilot study were excluded from the study sample later.

C. Field work:

The actual field work was carried out over 6 months period started from the beginning of January 2021 till the end of june 2021. The researcher was available two days / week (Sunday and Monday) at neonatal Intensive Care units affiliated to Sohag University Hospitals and one day weekly (Wednesday) at neonatal Intensive Care units affiliated to Ain Shams University Hospitals throughout the morning and afternoon shifts; from 11am to 1 pm for the morning shift and from 3 p.m. to 6 p.m. for the afternoon shift.

The researcher introduced herself to study subject and explained the purpose, importance and aim of the study to all nurses

before starting the data collection, each nurse was interviewed individually to identify background information and their practice were observed during actual neonatal care. The researcher collected data from two work shifts (morning & afternoon) by herself through meeting the study subjects of each hospital at working hours in groups, each group consisted of three nurses in each shift for two days per week according to availability of nurse and workload to fill the sheet and each sheet took time from (20: 30 minutes).

The nurses knowledge were assessed through questionnaire and Observational checklists which filled by the researcher through direct observation of nurses during providing actual care to neonates with tracheoesophageal fistula and observation checklists took time between (45: 60) minutes.

D. Ethical considerations:

Ethical approval was obtained from Ethical Committee of Faculty of Nursing, Ain Shams University before starting the study. Oral approval was obtained from each participant who agreed to share in this study. The researcher was clarifying the aim and objectives of the study to nurses included in the study before starting. Studied subjects assured that data was kept confidential and reported as a group data. Each subject was assured that anonymity, confidentiality and the right to withdraw from the study at any time would be guaranteed

II- Administrative Design:

An official permission to carry out the study was obtained by submission of a formal letter issued from the Dean of Faculty of Nursing, Ain Shams University to the director of each of the previously mentioned settings to collect the necessary data for the current study after a brief explanation of the purpose of the study and its expected outcomes.

IV- Statistical Design

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages and Mean SD. A chi-squared test is used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table. A correlation coefficient is a numerical measure of some type of correlation, meaning a statistical relationship between two variables.

Significance of the results:

- Highly significant at p-value < 0.01.
- Statistically significant was considered at p-value < 0.05.
- Non-significant at p-value ≥ 0.05

Results:

Table (1): Showed that more than half (51.4%) of the studied nurses were in the age group 25: < 30 years with mean age 29.64±6.44years and the majority of them (85.7%) were females. While, more than three fifths (62.9 %) of them were married. Concerning the qualification of studied nurses, nearly, half of them (48.6 %) were technical nursing institute graduates. Moreover more than two fifths 42.9 % of them had less than 5 years' experience with mean years of experience 7.89±2.3 years.

Table (2) Demonstrated that, more than half (55.0%) of the studied neonate their chronological age was 1: < 10 days., more than one third (35%) of them their gestational age 32: < 36 weeks with mean gestational ages 37.04±4.30 weeks, less than half (45%) were females. 45% of them their weight was ranged between 2500: < 3000 gm. with mean weight 2562.7±400.6 gm. Moreover 45.0 % of them their length was more than 50 cm with mean score52.1±4.30.

Figure (1): Showed that, one fifth (20%) of the studied nurses had good level of knowledge, more than third (37.10%) of them had average level of knowledge. While more than two fifths of

them had a poor level of knowledge regarding care of neonates having TEF.

Figure (2): Displayed that, more than half (54.3%) of the studied nurses had incompetent practices and more than two fifths (45.7%) of them had competent practices regarding care of neonates having tracheoesophageal fistula.

Table (3): Revealed that, there were a statistical significant relation between studied nurses' total score level of knowledge and their ages at (X^2= 7.107 *p*=.015). On the other hand, there were no statistical significant relation between studied nurses total score level of knowledge and their gender and marital status. Additionally, there were a statistical significant relation between nurses' qualification and their total score level of knowledge at (X^2= 13.08 *p*=.000). Also, there were a significant relation between nurses' years of experience and their total score level of knowledge at (X^2= 7.012 *p*=.017). Moreover, there were a statistically significant relation between attending training courses and their total score level of knowledge at (X^2=12.50 p=0.002).

Table (4): Revealed that, there were a statistically significant relation between nurses' age and their total score level of practices at (X^2= 22.16 *p*=0.02). On the other hand, there were no statistical significant relation between studied nurses' gender and marital status and their total score level of practices. Additionally, this table clarified that, there were a significant relation between studied nurses' qualifications and their total score level of practices at (X^2=13.81 *p=0*.03). Also, there were a significant relation between nurses' years of experience and their total score level of practices at (X^2=10.25 *p*=0.040). Moreover, it showed that, there were a statistically significant relation between attending of training courses and their total score level of practices at (X^2=17.197 *p=0*.004).

Table (5): Showed that, there were a statistical significant difference and a positive correlation between studied nurses' total score level of knowledge and their total score level of practices at (r= 0. 0.490, p= 0.000).

Table (1): Distribution of the Studied Nurses According to their Characteristics, (n=70).

Nurses' Characteristics	Number (No =70) No	Percentage (%) =100 %
Age in years		
20: < 25	2	2.9
25: < 30	36	**51.4**
30: < 35	16	22.9
35: < 40	12	17.1
≤ 40	4	5.7
$\bar{X}$ **±SD**		**29.64±6.44**
Gender		
Male	10	14.3
Female	60	**85.7**
Marital status		
Married	44	**62.9**
Single	18	25.7
Divorced	4	5.7
Widow	4	5.7
Qualifications		
Bachelor in Nursing Science	8	11.4
Technical Nursing Institute and specialty	12	17.1
Technical Nursing Institute	34	**48.6**
Diploma in Nursing	16	22.9
Years of experience at neonatal intensive care unit		
< 5		
5: < 10	30	**42.9**
10: ≤ 15	21	30
	19	27.1
$\bar{X}$ **±SD**		**7.89±2.3**

Table (2): Distribution of the Studied Neonates According to their Characteristics (n=20).

Neonate's Characteristics	No	%
Chronological age (days)		
1 < 10	11	**55**
10 < 20	9	45
$\bar{X}$ ±SD	**10.50±2.09**	
Gestational age (weeks)		
< 28	2	10
28: < 32	5	25
32: < 36	7	**35**
36: ≤ 42	6	30
$\bar{X}$ **S.D**	**37.04±4.30**	
Gender		
Male	11	**55**
Female	9	45
Birth weight in (gm)		
< 1000	1	5
1500: < 2000	3	15
2500: < 3000	9	**45**
3000: ≤ 3500	7	35
$\bar{X}$ **S.D**	**2562.7±400.6**	
Length (Cm)		
Less than 50cm	4	20
50cm	7	35
More than 50cm	9	**45**
$\bar{X}$ **±SD**	**52.1±4.30**	

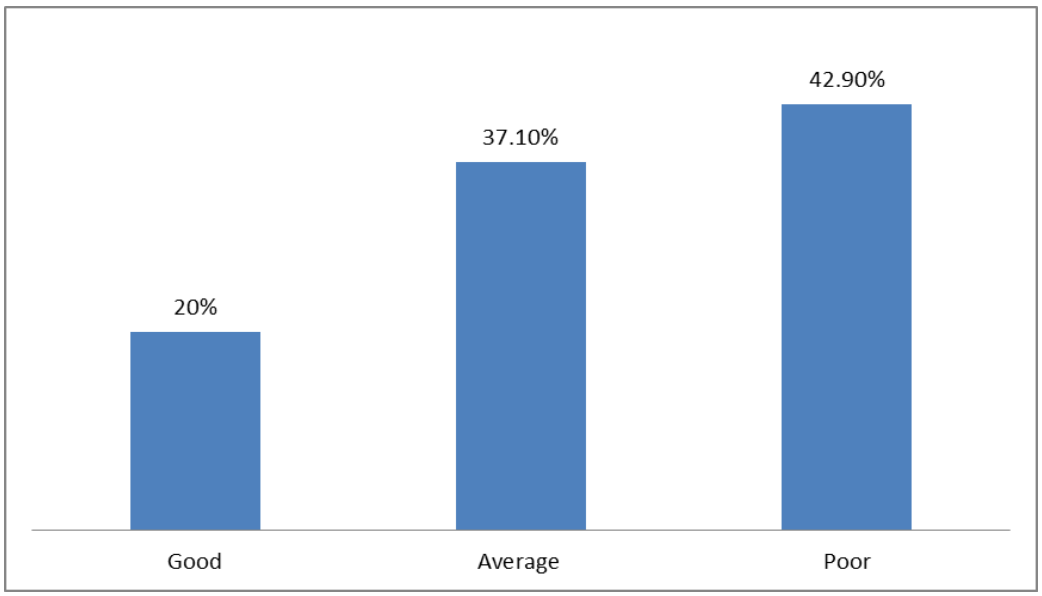

Figure (1): Percentage Distribution of the Studied Nurses According to Total Score Level of Knowledge Regarding Care of Neonates having Tracheoesophageal Fistula (N=70).

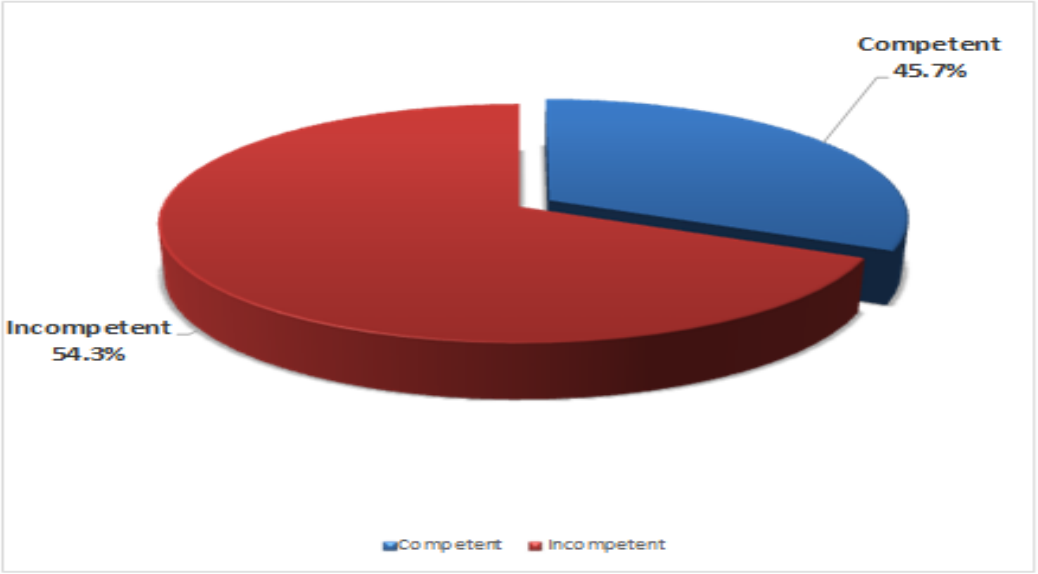

Figure (2): Percentage Distribution of the Studied Nurses' Total Score Level of Practice Regarding Care of Neonates having TEF (n=70).

Table (3): Relation between Characteristics of Studied Nurses and their Total Score Level of Knowledge Regarding Care of Neonates having TEF (n=70).

Nurses Characteristics		Total Score Level of knowledge						X^2	P-Value
		Good (n=14)		Average (n=26)		Poor (n=30)			
		No	%	No	%	No	%		
Age	20: < 25	2	14.3	0	0	0	0	7.107	**.015***
	25:< 30	10	71.4	18	69.2	8	26.7		
	30: < 35	2	14.3	7	26.9	7	23.3		
	35: <40	0	0	0	0	12	40.0		
	≤ 40	0	0	1	3.9	3	10.0		
Gender	Male	4	28.6	4	15.4	2	6.7	2.287	0.124
	Female	10	71.4	22	84.6	28	93.3		
Marital status	Married	8	57.1	17	65.4	19	63.3	6.283	.179
	Single	4	28.7	6	23.0	8	26.7		
	Divorced	1	7.1	1	3.9	2	6.7		
	Widow	1	7.1	2	7.7	1	3.3		
Qualifications	Bachelor	8	57.1	0	0	0	0	13.08	**.000****
	Technical Nursing Institute and specialty	4	28.7	7	26.9	1	3.3		
	Technical Nursing Institute	1	7.1	18	69.2	15	50.0		
	Technical Nursing School	1	7.1	1	3.9	14	46.7		
Years of experience	<5	10	71.4	18	69.2	2	6.7	7.012	**0.017***
	5: <10	3	21.5	4	15.4	14	46.7		
	10: ≤15	1	7.1	4	15.4	14	46.7		
Pervious attendance of training courses	Yes	13	92.9	17	65.4	2	6.7	12.50	**.002****
	No	1	7.1	9	34.6	28	93.3		

*significant at p ‹ 0.05. at p ‹ 0.01.

Table (4): Relation between Characteristics of Studied Nurses and their Total Score Level of Practices (n=70).

Nurses Characteristics		Total Score Level of practices				X^2	P-Value
		Competent (n=22)		Incompetent (n=48)			
		No	%	No	%		
Age	20: < 25	0	0	2	4.2	22.16	**.002****
	25:< 30	2	9.1	34	70.8		
	30: < 35	7	31.8	9	18.7		
	35: <40	10	45.5	2	4.2		
	≤ 40	3	13.6	1	2.1		
Gender	Male	4	18.2	6	12.5	.505	.950
	Female	18	81.8	42	87.5		
Marital status	Married	11	50.0	33	68.7	2.931	.239
	Single	8	36.4	10	20.8		
	Divorced	1	4.5	3	6.3		
	Widow	2	9.1	2	4.2		
Qualifications	Bachelor	7	31.8	1	2.1	13.81	**0.03***
	Technical Nursing Institute and specialty	10	45.5	2	4.2		
	Technical Nursing Institute	4	18.2	30	62.5		
	Technical Nursing School	1	4.5	15	31.2		
Years of experience	<5	2	9.1	28	58.3	10.25	**0.040***
	5: <10	4	18.2	17	35.4		
	10: ≤15	16	72.7	3	6.3		
Pervious attendance of training courses	Yes	22	100	10	20.8	17.197	**0.004****
	No	0	0	38	79.2		

*significant at p ‹ 0.05. at p ‹ 0.01.

Table (5): Correlation between Studied Nurses Total Score of Knowledge and their Total Score Level of Practices (n=70).

Item	Total Score Level of Knowledge	
	R	P- value
Total Score Level of Practices	0.490	0.000**

*significant at p ‹ 0.05. at p ‹ 0.01.

Discussion:

Tracheoesophageal fistula (TEF), remains one of the most challenging congenital anomalies of neonates. With an incidence of 2.43 cases per 10,000 births. Due to advances in prenatal diagnosis, neonatal critical care and surgical procedures, overall outcomes have improved substantially in recent years, including for premature children. Nevertheless, TEF is still associated with a life-long risk of complications, even if mortality is currently limited to those cases with associated severe life-threatening anomalies. Many unanswered questions still remain in surgical and clinical areas **(Parolini et al., 2017).** So this study aimed to assess the nurses 'performance regarding care of neonates with TEF.

Concerning the characteristics of the studied nurses, table (1) finding of the current study illustrated that, more than half of the studied nurses, their age ranged between 25: < 30 years with mean age 29.64±6.44 years and

majority of them were females. While, more than three fifths of the studied nurses were married. These findings were in agreement with **Abd- Elhamed et al., (2016)** entitled "Nurses, Knowledge and Practices Regarding Neonates with Tracheoesophageal Fistula at Assuit University Children Hospital" and mentioned that, about more than half of the studied nurses, their age ranged between 20: < 30 years with mean age 27.60±6.40 years and majority of them were females. Also, reported that slightly less than two thirds of the studied nurses were married.

Concerning qualifications of the studied nurses table (1) findings of the present study revealed that, nearly half of the studied nurses were technical nursing institute graduates. This finding was supported by the findings of **Buraihi & Mohammed, (2017)** in a study entiteled " effectiveness of an educational program on nurses' knowledge concerning prevent of post-thoracic surgery complications at Al-najaf teaching hospitals**"** who demonstrated that, the highest percentage of the study subject are nursing technical institute graduates.

But these findings came in contrast with **Bakhshi et al., (2018)** in a study entiteled "impact of instructions on the developmental status of premature infants on the clinical practice of neonatal intensive care unit (NICU) nurses" who reflected that, the majority of the NICU nurses had a master's degree.

These findings were also, disagree with **Mousa et al.(2021)** who reported in a study entitled "Nurses' Knowledge and Practice Regarding Developmental Supportive Care for Preterm and Low Birth Weight Infants in Egypt " that, a few number of the studied nurses graduated from technical nursing institutes. From the researcher point of view this is may be due to large number of nursing students did not complete their study to college

Concerning the studied nurses' years of experience, the findings of the present study table (1) indicated that, more than two fifths of the studied nurses had years of experience less than 5 years. This finding disagree with **Elsobkey & Amer, (2018)** who studied " effect of educational guidelines program about nursing care of neonates with TEF" and reported that, the majority of nurses had years of experience from 5 >10 years. This finding also disagree with **Guilhermino et al., (2018)** in a study about "education of NICU nurses regarding invasive mechanical ventilation: findings from a cross-sectional survey" and found that mean years of experience was 7.31 ± 3.81years.

From the researcher's point of view, NICUs especially who provide direct care to neonates having TEF must have adequate years of experience in order to be able to provide integrated nursing care and adapt with the complex nature of the malformation and these also, explains why more than two fifths of the studied nurses had poor level of knowledge and more than half of them had incompetent level of practices regarding care of neonate with TEF.

Concerning characteristic of the studied neonates table (2), finding of the present study revealed that, more than half of the studied neonate**'**s their chronological age ranged from 1< 10 days. While, more than third of them had gestational age between 32 ≤ 36 weeks with mean 37.04±4.30 weeks. These finding agree with **Charki et al., (2019),** who reported in a study entitled, "Experience of tracheo-esophageal fistula in neonates in a Tertiary Care Center - Case series in India" that, the majority of the studied neonates had chronological age 2-3 days and had gestational age ≥37 weeks with mean 40.04±5.30 weeks.

Also, the findings of the current study regarding gender of the studied neonate**'**s in table (2), revealed that, more than half of the studied neonates were males. While less than half of them their birth weight was ranged between 2500 to < 3000 gm with mean birth weight 2562.7±400.6 gm and had length more than 50cm with mean 52.1±4.30 cm. These finding was parallel to **Morini et al., (2020),** who mentioned in a study entitled "Diagnostic

Workup of Neonates with Esophageal Atresia: Results from the EUPSA Esophageal Atresia Registry in Hong Kong" and illustrated that, the majority of studied neonates were males.

Also, reported that, their weights were ranged between 2,054–3,150 gm with mean 2,670 ± 400.1gm and had more than 50 Cm of length with mean 40.1 ± 4.30 Cm.

Concerning studied nurse's characteristics and their total score level of knowledge figure (1) Showed that, one fifth (20%) of the studied nurses had good level of knowledge, more than third (37.10%) of them had average level of knowledge and more than two fifths of them had a poor level of knowledge regarding care of neonates having TEF.

These findings disagree with **Abd-Elhamed et al., (2016)** who mentioned in a study entitled "Nurses knowledge and practices regarding neonates having tracheoesophageal fistula at assuit university children hospital" that, about third of the studied nurses had good level of total knowledge. While, more than two third of them had a poor level of total knowledge regarding care of neonates having tracheoesophageal fistula.

From the researcher point of view these findings might be due to poor educational programs, lack of staff nurses and overload of work.

Concerning total score level of practices regarding care of neonates having TEF the current study findings in figure (2), displayed that, more than half of the studied nurses had incompetent practices, respectively. While, less than one third of them had competent practices regarding care of neonates having TEF.

These findings in the same line with **Abd-Elhamed et al., (2016)** who illustrated in a study entitled "Nurses knowledge and practices regarding Care of neonates with tracheoesophageal fistula at assuit university children hospital" that, more than two thirds of the studied nurses had incompetent practice regarding care of neonate having TEF.

Concerning relation between characteristics of the studied nurses and their total score level of knowledge table (3), the current study findings revealed that, there were a statistical significant relation between studied nurses' total score level of knowledge and their ages (25 < 30) years. On the other hand, there were no statistical significant relation between studied nurses' total score level of knowledge and their gender and marital status. Additionally, there were a statistical significant relation between nurses' qualification (Becholar graduates) and their total score level of knowledge.

Also, there were a significant relation between nurses' years of experience (less than 5 years) and their total score level of knowledge. Moreover, these findings illustrated that, there were a statistical significant relation between attending training courses and their total score level of knowledge.

These findings were consistent with **Eltaib et al., (2021)** who mentioned in a study entitled "Effect of Tracheostomy Care Guidelines on Internship Nurses Students' Performance and Confidence Level in Egypt" that, there was a statistical significant relation between studied nurses' total knowledge and their ages, qualifications & pervious attendance of training courses.

From the researcher point of view these findings might be due large number of newly graduates who had a base of knowledge.

Also, the current study findings regarding relation between characteristics of the studied nurses and their' total score level of knowledge in table (3), were in agreement with **Bahwa et al., (2020)** who carried out a study entitled " respiratory distress and its outcome among neonates admitted to neonatal intensive care unit of mukalla maternity and child hospital, Yemen" and mentioned that, there

were a statistical significant difference between the studied nurses' total score level of knowledge and their age, years of experience and previous attending of training courses. While, there were no statistical significant difference between studied nurses total score level of knowledge and their gender & marital status.

Regarding relation between characteristics of the studied nurses and their total score level of practices table (4), the current study findings revealed that, there were a statistical significant relation between the studied nurses' age (35 < 40 years) and their total score level of practices. On the other hand, there were no statistical significant relation between studied nurses' gender & marital status and their total score level of practices. Additionally, this table clarified that, there were a significant relation between studied nurses' qualifications (Technical nursing institute and speciality graduates) and their total score level of practices. Also, there were a significant relation between nurses' years of experience (10 ≤ 15 years) and their total score level of practices. Moreover, it showed that, there were a statistical significant relation between attending of training courses and their total score level of practices.

These findings were in the same line with **El-Ziady et al., (2017)** who mentioned in a study entitled "Effect of Implementing an Educational Program About Family Centered Developmental Care on Neonatal Nurses' Knowledge and Practices at Neonatal Intensive Care Units in Egypt" that, there were a statistical significant relation between studied nurses' total score level of practices and their ages, qualifications and years of experiences.

Also, the findings in table (4), were congruent with **Rahimi, (2017)** who mentioned in a study entitled "Impact of Training on Nurses Performance and Productivity at Neonatal Intensive Care Unit in Pakistan " that, there weren't a significant difference between studied nurses' total score level of practices and their years of experience, qualifications and pervious attending of training courses and also found that there were no statistical significant difference between studied nurses' total score level of practices and their gender and marital status.

From the researcher point of view these findings might be due to cooperation between nurses and variability of ages and qualifications between nurses in the same shift.

Concerning correlation between studied nurses' total score level of knowledge and their total score level of practices table (5), the current study findings cleared that, there were a statistical significant difference and positive correlation between studied nurses' total score level of knowledge and their total score level of practices. These findings were in agreement with **Ebrah & Yousif, (2020)** who mentioned in a study entitled "The Effect of Intervention on Nurse's Performance Regarding Feeding of Premature Baby in Neonate Care Unit at Public Hospitals in Hodeida City: Yemen" that, there were a statistical significant difference and positive correlation between studied nurses total score level of knowledge & their total score level of their practices.

From the researcher point of view these findings might be due to high proportion of the studied nurses didn't attend training courses.

Conclusion:

In the light of the current study findings, it can be concluded that, the findings answered the research questions and proved its aim. Moreover, there were more than two fifths of the studied nurses had a poor knowledge about tracheoesophageal fistula and its care. Also, there were more than half of them had incompetent practices regarding care of neonates having tracheoesophageal fistula. Also, there were a statistical significant difference and positive correlation between studied nurses total score level of knowledge and their total score level of practices.

Recommendations:

In the light of the current study findings, the following recommendations are suggested:

- Periodic assessment of knowledge and practice of all nurses dealing or providing care of neonates having tracheoesophageal fistula.
- Emphasize on the importance of continuous training on appropriate nursing intervention which should be designed according to actual needs of neonates having tracheoesophageal fistula.
- Educational posters, booklets, handouts and procedures in the neonatal surgical intensive care units including pre & postoperative care regarding neonates having tracheoesophageal fistula may be more beneficial for nurses.

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