

## Effectiveness of Teaching Guidelines regarding Pediatric Triage Assessment and Management of Critically Ill Children on Nurses' Performance

Huda Shawky<sup>1</sup>, Azza El-Sayed Ali Hegazy<sup>2</sup>, Amina Mohamed Thabet<sup>3</sup> and Etamad Hassein Sayed<sup>4</sup>

<sup>1</sup>Lecturer of Pediatric Nursing, Faculty of Nursing, Helwan University

<sup>2</sup>Lecturer of Pediatric Nursing, Faculty of Nursing, El-Fayoum University

<sup>3</sup>Assistant professor of Pediatric Nursing, Faculty of Nursing, Sohag University

<sup>4</sup>Lecturer of Pediatric Nursing, Faculty of Nursing, Assiut University

### Abstract

**Background:** The pediatric nurses in emergency care settings are the first persons whom the patient encounters, and the nurses' knowledge of the triage system has been cited as an influencing factor in the triage decision. Triage skills are core competency required for emergency nurses. **This study aimed to** evaluate the effectiveness of teaching guidelines regarding pediatric triage assessment and management of critically ill children on nurses' performance. **Research design:** This study used a quasi-experimental research design. This study consisted of thirty-eight nurses working at Pediatric Intensive and Emergency Care Units in Sohag University and General Hospital. **A pre-designed interview questionnaire (pre-posttest)** was used to collect the data: It consisted of 3 parts; part 1 about nurses' personal characteristics, part 2 to assess nurses' knowledge regarding pediatric triage system and part 3 about assessment and management of critically ill children's guidelines according to WHO, (2013). **Results:** The nurses' overall mean of knowledge in the pre-test was  $8.05 \pm 2.25$  and their practice was  $20.89 \pm 1.66$ , while, their mean knowledge and practice was significantly improved ( $p = 0.000$ ), where they were  $25.53 \pm 2.91$  and  $27.82 \pm 3.68$  immediately after implementation of the guidelines. **Conclusion:** Teaching guidelines had highly statistically significant positive effect on improving the studied nurses' performance regarding pediatric triage assessment and management of critically ill children. In addition, there was statistically significant moderate positive correlation between triage knowledge and triage practice among the studied nurses. **Recommendation:** Implementing the triage system in all pediatric emergency care to obtain appropriate and effective priority for patients, which in turn will reduce the financial burdens and overcrowding the problems in emergency settings.

**Keywords:** Teaching Guidelines, Pediatric Triage Assessment, Management, Critically Ill Children, and Nurses' Performance

### Introduction

Triage is defined as the prioritization or sorting the patients for care and treatment that is due to a lack of needed resources in the emergency department (ED) (Mirhaghi et al., 2015). Critical illness is defined as any serious problem with breathing, airway or circulation, or acute deterioration of conscious state; includes upper airway obstruction, apnea, hypoxemia, acute respiratory distress, central cyanosis, inability to feed, severe dehydration, shock, active bleeding requiring transfusion and seizures or loss of consciousness (World Health Organization, 2016).

The triage systems aimed to provide a fair clinical assessment of sick, poisoned children and injured. It is providing a good effective approach to the organization, monitoring and evaluation of emergency medical care in pediatric EDs. Over the past twenty years in the world, triages systems have been standardized in a number of countries are making efforts to ensure the sustainability of the compulsory implementation (Alvarez et al., 2012 & Mejinoll et al., 2020).

Pediatric Emergency Triage is necessary to prioritize management according to the severity condition of children. Triage is the keystone of care organization and means "sorting of children" for priority treatment in Pediatric Emergency Triage Services. Triage,

is a process of collecting relevant information on children who seek emergency care in order to initiate decision-making procedures using a valid and reliable triage system. Quick and accurate triage decisions are essential to successful ED operations and optimal outcomes for the children. Many factors influence the outcome of a child's triage result, so performance evaluation is pivotal (Aloyce et al., 2014).

Many educational triages programs are supported under assumption that knowledge acquisition will improve triage decisions. Therefore, the ability of the triage nurse to make accurate clinical judgments about patient urgency and need for intervention is essential to provide safe and effective emergency care, including triage. Triage is one of the weakest parts of the health system in low-income countries compared to industrialized countries; it can be life-saving and cost-effective care, if it is well organized (Robert et al., 2014).

The wide variety will increase in children presenting to emergency care setting makes it greater vital to triage them to the most appropriate level of care. Due to the overcrowding of pediatric patients, it will become greater if there is a priority. In addition, nurses are less knowledgeable about triage children in general hospitals (Allen et al., 2015). The triage skill of nurses is an essential component of ED supervision. If not performed at the standard level, the outcomes of clinical care and the efficiency of EDs are compromised (Kelly and Richardson, 2001).

### Significance of the study

Children death rates were 93 deaths per 1000 live births in 1990 and decreased to 38 in 2019. The global burden of child and youth deaths however remains immense. In 2019 alone, 7.4 million child, adolescents and youth (0-14 years) died mostly of preventable or treatable causes. The burden of child mortality also remains unevenly distributed. The highest under-five mortality rate remains in the WHO African Region (74 per 1000 live births), around 9 times higher than that in the WHO of European Region (8 per 1000 live births). A Child death rate in hospitals often occurs within the first 24 hours of admission. Many of

these deaths could be prevented if extremely sick children were identified and appropriate treatment started immediately upon arrival at the health facility. This can be facilitated by rapid triage system for all children presented to the hospitals to determine if there are any emergency or priority signs and to provide appropriate emergency treatment (World Health Organization, 2016).

### Aim of the study

This study aimed to evaluate the effectiveness of teaching guidelines regarding pediatric triage assessment and management of critically ill children on nurses' performance throughout:

1. Assess nurses' basic knowledge and practices regarding triage assessment and management of critically ill children.
2. Teaching the WHO guidelines about triage assessment and management of critically ill children for the studied nurses.
3. Comparing the nurses' performance (knowledge and practices) before and after teaching the guidelines.

### Research Hypotheses:

H1: The nurses' baseline performance would be low before teaching the guidelines regarding the triage assessment and management of critically ill children.

H2: The nurses' knowledge would increase in post-test after teaching the guidelines compared to the pretest.

H3: The nurses' practices would improve in post-test after teaching the guidelines compared to the pretest.

H4: There is a positive correlation between the nurses' knowledge and practices after teaching the guideline

H5: The nurses' personal characteristics will influence their performance.

### Subjects and Methods

#### Research design:

This study used a quasi-experimental research design (pre-posttest).

#### Setting:

The study was conducted at Pediatric Intensive Care and Pediatric Emergency Care Units of Sohag University and General Hospitals;

which providing emergency triage assessment and treatment for pediatric ill children. The study was conducted over 3 months from end of October 2020 to the end of January 2021.

### **Sampling:**

The non-probability convenience sampling technique was used to obtain the study subjects. One group of nurses consisted of thirty-eight nurses working in the previously selected areas who participated in the study. All nurses available at the time of the study were enrolled.

### **Dependent and independent variables:**

#### **A. Independent variable:**

The researchers manipulated guidelines regarding triage assessment and management of critically ill children for nurses as an independent variable in this experimental research.

#### **B. Dependent variable:**

The nurses' performance in this study was the dependent variables. These dependent variables were the variables that changed as predicted in the research hypotheses in response to the independent variable when the independent variable (teaching guidelines) was manipulated by the researchers.

### **Tools for data collection:**

**A pre-designed interview questionnaire (pre-posttest)** was used to collect the essential data, it was written in a simple Arabic language to suit the nurses' categories. It consisted of 3 parts as follows:

**Part 1:** Included 9 questions designed by the researchers about nurses' personal characteristics such as age, gender, marital status, educational qualifications, years of experience in the emergency department, job, shift work, attendance of training courses in triage care and presence of pediatric triage care in the pediatric hospital.

**Part 2:** Designed by the researchers to assess the nurses' knowledge regarding the pediatric triage system, written based on the researchers' experience and reading review of literatures and included 31 questions (Definition, types of triage, distinguish between the triage system cards color, emergency signs, priority signs,

urgent and non-urgent duration, objective data, subjective data.....etc.).

The total mean scores of nurses' knowledge were calculated as follows: one score was given for a correct answer, and zero was given for incorrect answer for each knowledge question. The total score for the nurses' knowledge was 31 questions. According to the nurses' answers, the total mean of knowledge was calculated.

**Part 3:** Concerning the triage assessment and management of critically ill children's guidelines according to **WHO (2013)**, it included 36 questions that were answered according to the nurses' report. The total mean scores of nurses' practices were calculated as: The practices which completely done was given one score, and incompletely done or not done was given zero scores. The total score of nurses' practices was 36 score; pediatric triage assessment (24 items) and management of critically ill children (12 items). According to the nurses' responses, the total mean practices were calculated.

### **Pilot study:**

A pilot study was conducted on 10 % of the study subjects (4 nurses) to test the applicability of the tool and whether there was any modification. As no modification was done and few nurses were presented in the selected setting, the pilot study was included in the study.

**Content and face validity:** Confirmed by a Jury of three experts (professors in pediatric nursing in Sohag and Assiut University), understanding and ease of application have been changed based on their opinion modifications.

### **Test of reliability:**

Questionnaire items were tested for reliability by the Alpha Cronbach's test. The alpha reliability of part 2 (knowledge) was 0.81, and the reliability of part 3 (practices) was 0.84.

### **Methods of data collections:**

**Administrative approval** was obtained from the responsible persons (directors of Sohag University and General Hospitals and head of emergency care unit).The researchers introduced themselves to the nurses in the

emergency care and informed them about nature and purpose of the study.

**Ethical consideration:** Written informed consent was obtained from the nurses after explanation of the study purpose and before enrollment in the study. The researchers informed them that the information obtained would be used for study purposes only. Nurses had the right to withdraw from the study at any time during the study.

The researchers asked the participants to fill the questionnaire; data were collected at different times, during shifts (morning, afternoon, night) in the study period from August 2020 to January 2021. After checking and reviewing all filled questionnaires, the data were entered into the computer using SPSS (Statistical Package for Social Science) software version 23 for data coding, entry and analysis.

#### **Teaching Guidelines of Triage Assessment and Management for Common Childhood Illnesses according to World Health Organization (2013):**

Teaching the knowledge part was carried out into two sessions for two days in each area. Each session take 1 hour to discuss the content and 15 minutes to conclude and ask questions. The topics for each day are as follows:

- Day 1 (first session): Taught to pediatric nurses: Definition of triage, types of triage, distinguishes between the Triage system cards colors, and urgent and non-urgent duration-the duration of triage scale.
- Day 2 (second session): Taught the emergency signs, priority signs, objective and subjective data, conclusion and end of the session.

Teaching the practical part regarding triage assessment and management of common childhood illnesses is carried out into two sessions for two days in each area. Each session takes 1 hour to discuss the content and 15 minutes to conclude and ask questions. The topics for each day are as follows:

Day 1 (session 1): Taught the steps of pediatric triage assessment

Step 1. Check if there are any breathing or airway problems:

- Airway and breathing assessment (A, B)
- Circulation assessment (for shock) (C)

Step 2. Assess the child for severe dehydration if he suffers from diarrhea.

Step 3. Assess for coma or convulsions or other abnormal mental status: Check the level of consciousness

Day 2 (session 2): Taught the following:

- Check emergency and priority signs
- Pediatric emergency triage management

**Evaluation the effectiveness of the guidelines** on the nurses' retention of knowledge and practices was assessed by two post-tests. The first post-test carried out immediately after teaching the guidelines and the second was done one-month later.

#### **Statistical analysis:**

Data entry and statistical analysis were done using SPSS computer program version 23 software. Data were tested for normality using the Anderson-Darling test and homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (N, %). Continuous variables described by the mean and standard deviation (Mean, SD); a chi-square test used to compare the categorical variables. T- test was used to compare the continuous variables. Pearson's and Spearman's correlations are used to determine the relationship between quantitative and qualitative variables. Statistical significance was considered at P-value  $\geq 0.05$ .

#### **Results**

**Table 1** shows that, more than one third of nurses (36.8%) were aged  $25 < 30$  years, 28.9% of them were aged  $\geq 30$  years. Slightly less than two three quarters of the studied nurses (71.1%) were females. More than half of the nurses (52.6%) had diploma degree, 26.3% had a technical nursing education, 18.4% with bachelor's degree of nursing and only 2.6% had master degree. Only 10.5% of nurses had less than one year of working experience, 34.2% had  $5 < 10$  and  $\geq 10$  respectively. Also, in this study, the majority of nurses (89.5%) didn't attain triage training and their hospitals didn't have triage system in the care of pediatric critical illness.

**Figure 2** reveals that, the studied nurses' mean score of practice was  $20.89 \pm 1.66$  in the pre-test, while their mean improved immediately after teaching the guidelines in post-test I and after one month of following up with post-test II ( $30.74 \pm 2.62$  and  $27.82 \pm 3.68$  respectively).

**Table 2** shows that, the mean  $\pm$  SD of the studied nurses' knowledge was lower in pre-test than in post-test I and in post-test II ( $8.05 \pm 2.25$ ,  $20.89 \pm 1.66$  and  $25.53 \pm 2.91$  respectively). Also, the mean  $\pm$  SD for the studied nurses' practices was improved after teaching the guidelines in the immediate post-test I and post-test II ( $27.32 \pm 2.38$  and  $30.74 \pm 2.62$  respectively) and was lower in pre-test ( $20.89 \pm 1.66$ ) with highly statistically significant differences ( $P=0.000$ ).

**Figure 1** finds that, there were significant moderate positive correlations between the studied nurses scores of knowledge and practices at post-test ( $r = 0.368$ ,  $p 0.023$ ).

**Table 3** presents the association between the studied nurses' total mean scores of knowledge

and selected demographic variables. The current study showed in the pre-test that, there were significant differences between the nurses' level of knowledge and nurses who had training about triage care ( $p$ -value = 0.037). While, in post-tests, significant differences were found between nurses' years of experience and their level of knowledge with a high prevalence among nurses with  $1 < 5$  years of experience ( $P = 0.038$ ). No significant differences were found between nurses' level of knowledge and other personal characteristic as age, sex, level of education at pretest, and immediately after post-test I and post-test II.

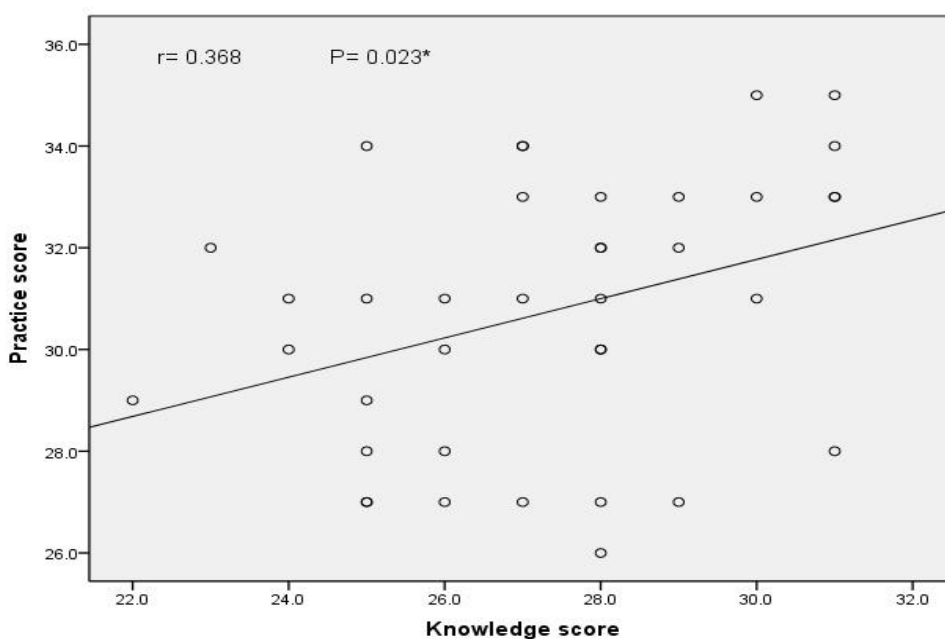
**Table 4** demonstrates the associations between the studied nurses' total mean scores of practices and selected personal variables. As shown in this table, no significant differences were found between the nurses' mean scores of practices and their age, sex, level of education, working shifts and previous training on triage system. While, there was a significant differences regarding years of experience in the emergency department in post-test I ( $p = 0.015$ ).

**Table 1. Frequency and percentage distribution of the studied nurses' personal characteristics (n= 38).**

Personal data	No. (38)	%
<b>Age (years)</b>		
< 20	6	15.8%
20 < 25	7	18.4%
25 < 30	14	36.8%
$\geq 30$	11	28.9%
<b>Sex:</b>		
Male	11	28.9%
Female	27	71.1%
<b>Level of education:</b>		
Diploma degree	20	52.6%
Technical Nursing Institute	10	26.3%
Bachelor of nursing	7	18.4%
Master degree	1	2.6%
<b>Years of experience in the emergency department:</b>		
< 1	4	10.5%
1 < 5	8	21.1%
5 < 10	13	34.2%
$\geq 10$	13	34.2%
<b>Attaining triage training:</b>		
Yes	4	10.5%
No	34	89.5%
<b>Hospital triage is performed:</b>		
Yes	0	0.0%
No	38	100.0%

**Table (2): Comparison between the Mean± SD of nurses' knowledge and practice at pre-test, immediately post-test, and post-test after one month of the educational guidelines.**

Items	Pre-test (n= 38)	Immediately post-test (n= 38)	Post-test I after one month (n= 38)	II P-value
<b>Knowledge scores:</b>				
Mean ± SD	8.05 ± 2.25	27.32 ± 2.38	25.53 ± 2.91	0.000*
Range	6.0-19.0	22.0-31.0	19.0-31.0	
<b>Practices scores:</b>				
Mean ± SD	20.89 ± 1.66	30.74 ± 2.62	27.82 ± 3.68	0.000*
Range	18.0-25.0	26.0-35.0	20.0-34.0	



**Fig. (1): Correlations between the studied nurses' scores of knowledge and practices at post-test**

**Table 3: The associations between the studied nurses' total mean scores of knowledge and their personal characteristics (N=38).**

Personal characteristics	Knowledge mean score		
	Pre-test	Post-test I	Post-test II
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
<b>Age:(years)</b>			
< 20	7.67 $\pm$ 0.82	27.50 $\pm$ 2.26	25.50 $\pm$ 3.56
20 < 25	7.71 $\pm$ 2.43	28.00 $\pm$ 2.71	26.29 $\pm$ 3.50
25 < 30	8.07 $\pm$ 1.14	26.71 $\pm$ 2.37	25.50 $\pm$ 1.87
$\geq$ 30	8.45 $\pm$ 3.59	27.55 $\pm$ 2.42	25.09 $\pm$ 3.53
<b>P-value</b>	<b>0.886</b>	<b>0.675</b>	<b>0.877</b>
<b>Sex:</b>			
Male	7.82 $\pm$ 1.17	27.82 $\pm$ 2.27	26.45 $\pm$ 2.30
Female	8.15 $\pm$ 2.58	27.11 $\pm$ 2.44	25.15 $\pm$ 3.08
<b>P-value</b>	<b>0.688</b>	<b>0.414</b>	<b>0.214</b>
<b>Level of education:</b>			
Diploma degree	7.70 $\pm$ 1.49	27.20 $\pm$ 2.26	25.15 $\pm$ 2.78
Technical Nursing Institute	7.80 $\pm$ 1.14	27.30 $\pm$ 2.91	25.40 $\pm$ 2.37
Bachelor of nursing/ Master degree	9.25 $\pm$ 4.13	27.63 $\pm$ 2.26	26.62 $\pm$ 3.85
<b>P-value</b>	<b>0.243</b>	<b>0.917</b>	<b>0.486</b>
<b>Years of experience in the emergency</b>			
< 1	7.50 $\pm$ 0.58	27.50 $\pm$ 0.58	24.00 $\pm$ 2.83
1 < 5	8.13 $\pm$ 2.23	28.13 $\pm$ 3.04	28.00 $\pm$ 2.27
5 < 10	7.77 $\pm$ 1.09	26.77 $\pm$ 2.42	25.31 $\pm$ 1.93
$\geq$ 10	8.46 $\pm$ 3.33	27.31 $\pm$ 2.32	24.69 $\pm$ 3.43
<b>P-value</b>	<b>0.842</b>	<b>0.670</b>	<b>0.038*</b>
<b>Previous training about triage system:</b>			
Yes	10.25 $\pm$ 5.91	26.50 $\pm$ 1.29	24.25 $\pm$ 4.11
No	7.79 $\pm$ 1.37	27.41 $\pm$ 2.48	25.68 $\pm$ 2.78
<b>P-value</b>	<b>0.037*</b>	<b>0.477</b>	<b>0.361</b>

\* = significant differences

Table 4: The associations between the studied nurses' total mean scores of practices and their personal characteristics (N=38).

Personal characteristics	Practices scores		
	Pre-test	Post-test I	Post-test II
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
<b>Age:(years)</b>			
< 20	20.00 $\pm$ 0.63	32.50 $\pm$ 1.22	27.50 $\pm$ 4.18
20 < 25	20.57 $\pm$ 1.13	31.71 $\pm$ 2.29	28.57 $\pm$ 1.27
25 < 30	21.14 $\pm$ 1.83	30.00 $\pm$ 2.66	27.71 $\pm$ 4.46
$\geq$ 30	21.27 $\pm$ 2.00	30.09 $\pm$ 2.91	27.64 $\pm$ 3.72
<b>P-value</b>	<b>0.421</b>	<b>0.137</b>	<b>0.950</b>
<b>Sex:</b>			
Male	20.82 $\pm$ 1.83	31.00 $\pm$ 3.16	27.82 $\pm$ 4.24
Female	20.93 $\pm$ 1.62	30.63 $\pm$ 2.42	27.81 $\pm$ 3.51
<b>P-value</b>	<b>0.859</b>	<b>0.698</b>	<b>0.998</b>
<b>Marital status:</b>			
Single	20.75 $\pm$ 1.45	31.20 $\pm$ 2.28	27.40 $\pm$ 3.42
Married	21.06 $\pm$ 1.89	30.22 $\pm$ 2.92	28.28 $\pm$ 3.98
<b>P-value</b>	<b>0.577</b>	<b>0.256</b>	<b>0.470</b>
<b>Level of education:</b>			
Diploma degree	21.05 $\pm$ 1.43	30.80 $\pm$ 2.24	28.35 $\pm$ 2.94
Technical nursing education	21.00 $\pm$ 2.05	30.10 $\pm$ 3.00	25.80 $\pm$ 4.76
Bachelor of nursing/ Master degree	20.38 $\pm$ 1.77	31.38 $\pm$ 3.16	29.00 $\pm$ 3.25
<b>P-value</b>	<b>0.618</b>	<b>0.596</b>	<b>0.117</b>
<b>Years of experience in the emergency department:</b>			
< 1	19.75 $\pm$ 0.50	32.75 $\pm$ 1.26	27.25 $\pm$ 2.22
1 - < 5	21.00 $\pm$ 0.93	32.63 $\pm$ 1.77	28.75 $\pm$ 3.41
5 - < 10	20.85 $\pm$ 1.95	30.00 $\pm$ 2.31	27.54 $\pm$ 4.45
$\geq$ 10	21.23 $\pm$ 1.88	29.69 $\pm$ 2.84	27.69 $\pm$ 3.61
<b>P-value</b>	<b>0.494</b>	<b>0.015*</b>	<b>0.883</b>
<b>Previous training about triage system:</b>			
Yes	20.00 $\pm$ 2.16	30.50 $\pm$ 2.89	27.25 $\pm$ 3.40
No	21.00 $\pm$ 1.60	30.76 $\pm$ 2.63	27.88 $\pm$ 3.75
<b>P-value</b>	<b>0.259</b>	<b>0.851</b>	<b>0.750</b>

\* = significant differences



## Discussion

All pediatric nurses must have access to appropriate resources and demonstrate critical competencies to providing safe, effective and stabilizing emergency care to pediatric patients in the ED settings, regardless of the volume of pediatric visits to the ED. Too much responsibility for ED preparedness in terms of staff competency assessment; developing policy and procedure; procurement of equipment and supplies; quality improvement planning; implementation, documentation, disaster planning and staff education lies firmly under the auspices of the emergency nurse leader (Snow, 2016). So, this study aimed to, evaluate the effectiveness of teaching guidelines regarding pediatric triage assessment and management of critically ill children on nurses' performance.

The current study showed that the minority of the studied nurses aged  $25 < 30$ , and  $\geq 30$  years old. This finding was matched with the results of another study conducted by Gargamo et al., (2019) who mentioned that more than third of participants were between the ages of 20-30 years with a mean age of  $30.38 \pm 5.2$  years and slightly different with Sedaghat et al., (2021) who reported that the mean age of subjects in

their study was 31 years old. Also, majority of nurses in the current study were females. This finding was matched the results of another study performed by Fathoni et al., (2013) who stated that more than two thirds of nurse were females.

As regard nurses' level of education, more than half of them had a diploma degree, followed by nearly one third had technical nursing education and few nurses had a Bachelor of Nursing Science. This result was agreed with other study result conducted by Fathoni et al., (2013) who reported that most nurses had a diploma degree. The rest had a bachelor degree in nursing.

Regarding years of experiences, the results of the present study revealed that, few nurses worked less than 1 year, more than third had  $5 < 10$  years' experience and more than third had  $\geq 10$  years. Also, the majority of nurses had no

triage training courses and their hospitals didn't perform triage system in pediatric critical care. This finding is inconsistency with another study conducted by Shehab et al., (2017) who reported that, more than half of the studied sample were less than 5 years and the majority of participants in the study group reported that each of them didn't attend any training courses regards triage.

As regards to the studied nurses' total mean of knowledge, the current study demonstrated that, their mean score of knowledge was lower in pre-test than in post-test, the peak increase in their knowledge was immediately after teaching the guidelines and slightly decreased after one month (post-test II). Also, the mean scores of the nurses' practices were lower in the pretest than in post-test and the nurses practices were improved in the immediate post-test and in follow-up post-test after one month with highly significant differences. These results agreed with Pouraghaei et al., (2013) who mentioned that training courses related to initiation of triage procedure had a significant impact on increasing participants' knowledge and performance. In addition, the total scores improved from 22.02 to 28.54 after the program. Also, Kerie et al. (2018) stated that, more than half of the participants had a moderate level of pretest triage skills.

These results answered the first study hypothesis that nurses' baseline knowledge and practices were low before teaching the guidelines regarding the triage assessment and management of critically ill children. From the researchers' point of view, because more than half of nurses in the current study graduated at diploma level of education, and fewer attended a specific triage training or course, so their triage knowledge and practice as will were low before teaching WHO guidelines. Also, supported the second and third study hypothesis, the nurses' knowledge and practices were improved in post-test after teaching the guidelines compared to before. From the researchers' point of view, these results related to, teaching the guidelines has a significant impact on improving the nurses' performance; this was evidenced in post-test evaluation.

Also, the present results were matched with

those obtained from a study carried out by **Allen et al., (2015)** who showed that in pretest more than two thirds of study participants had poor knowledge of the triage system. Moreover, the results obtained by **Robert et al., (2014)** found that more than third of respondents were not knowledgeable about triage in a pretest. While, these findings were inconsistent with **Afaya et al., (2017)** who revealed that about two thirds of the respondents were knowledgeable about the triage system in the pretest.

The present study finding demonstrated that, significant relation was found between the studied nurses' years of experience and their total mean score of knowledge post-test 2, with high prevalence among nurses who had  $1 < 5$  years' experience ( $P\text{-value} = 0.038$ ), while in pre-test no significant difference. Also, no significant differences were found between their mean scores of knowledge and other personal characteristics as age, gender, level of education in the pretest, immediate post-test I, and post-test II.

These findings were in line with the study of **Fathoni et al., (2013)** who established that, there were significant positive correlations between working experience ( $r = 0.27$ ,  $p < .01$ ) and triage knowledge ( $r = .38$ ,  $p < .01$ ). Also, **Shehab et al., (2017)** stated that, there was no statistically significant relation between nurses' socio-demographic data and their total knowledge score throughout the three levels of the educational program.

The current study result showed that there was no significant relation found between the studied nurses' total mean score of practice and their age, sex, level of education, job title, working shifts and previous training on triage system. While, there are significant relation regarding years of experience in the emergency department in post-test I ( $P = 0.015$ ). These results were matched with another study conducted by **(Considine et al., 2007)** who founded that, there were no significant relations between work experiences and triage practices. More experienced and less experienced emergency nurses could have the same ability to perform triage. Also, **Kerie et al., (2018)** stated that, there was no significant

relations between the nurses' educations, work experience and work shift with their total scores of performance.

These results were not support the study fifth hypothesis that the nurses' personal characteristics will influence their performance. *From the researcher's point of view*, the influences regarding increasing the nurses' knowledge and improving their practices may depend mainly on the acquisition of knowledge and practices from the teaching of guidelines not from their personal characteristics.

The current study founded significant moderate positive correlations between the studied nurses' total means score of knowledge and practices ( $r = 0.368$ ,  $P = 0.023$ ). This result was agreed with the study result conducted by **Kerie et al., (2018)** who stated that, a significant positive relationship was found between nurses' level of triage knowledge and practices ( $r = .68$ ,  $p .01$ ). These results were supported the study fourth hypothesis that there are positive correlations between the nurses' knowledge and their practices after teaching the guidelines.

#### Limitation:

The results' interpretation must acknowledge some limitations such as; small sample size and the studied nurses' practice reported by them. Future studies should try to ensure that research should be performed in an adequate sample size of the subjects to generalize the results.

#### Conclusion

**In the light of the current study results, it can be concluded that:**

The nurses' mean scores of performance before teaching the WHO guidelines regarding pediatric triage assessment and management of critically ill children was lower in pretest than in post-test after teaching the guidelines. In addition, there was a significant moderate positive correlation between triage knowledge and triage practice among the studied nurses. This means that if the triage knowledge is high, the triage practices will also be high.

Finally, teaching the WHO guidelines had highly statistically significant positive

improving nurses' performance regarding pediatric triage assessment and management of critically ill children. This could serve as a basis for the development of in-service education and training programs that emphasized the specific triage knowledge to improve nurses' practices.

### Recommendation

Based on the results of this study, the researchers recommended that:

1. Implementing the designed triage system in all pediatric emergency care to obtain appropriate and effective priority for patients, which in turn will reduce the financial burdens and overcrowding the problems in emergency settings.
2. Refreshing in-service training/education workshops for nurses regarding triage assessment and care of critically ill children should be conducted to improve the quality of care and patient safety.
3. World Health Organization pediatric triage assessment and management of critically ill children and handouts on triage intervention should be available in all pediatric emergency care settings.
4. Replication of this study is needed on large subjects and in different settings and overcome regarding nurses' practice reported by them to generalize the results.

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