*Assiut Scientific Nursing Journal*
*http://asnj.journals.ekb.eg*
*http://www.arabimpactfactor.com*
*DOI: 10.21608/ASNJ.2022.104400.1256*

# Enhancing Nurse Interns` Knowledge and Practice Regarding Triage at Emergency Units during COVID 19 Pandemic

**Hoda A. El-Guindy[1], Mahdia Morsy El-Shahate[2] & Nora Ahmed Abd Allah Mohamed[3]**
[1.] Assistant Professor of Nursing Administration, Faculty of Nursing, Beni-Suef University, Egypt.
[2.] Assistant Professor of Nursing Administration, Faculty of Nursing, Benha University, Egypt
[3.] Assistant Professor of Nursing Administration, Faculty of Nursing, Benha University, Egypt

## Abstract
**Background:** Nurse Interns' knowledge, practice regarding triage and adherence to preventive behaviors has been influential factors in triage decision-making at emergency units during COVID 19 Pandemic. **Aim of the study:** Enhancing nurse interns` knowledge and practice regarding triage at emergency units during COVID 19 pandemic. **Design:** A quasi experimental design was utilized in this study. **Setting:** Emergency Units at Benha University Hospital. **Subjects:** A convenient sample of 60 nurse interns. **Tools for data collection:** Intern Nurses` Personal Characteristics Sheet, Nurse Interns` Knowledge Questionnaire, Triage Practice Observational Checklist, COVID-19 Preventive Behavior Assessment Tool. **Results:** Nurse interns' knowledge, practice regarding triage was highly statistically significally improved after the program implementation. Also, their preventive behavior regarding COVID-19 level was highly statistical significant improved after the program implementation. As (72.7%) of them had poor preventive behavior level, that improved to (86.6%) had good preventive behavior level post program. **Conclusion:** the triage program had a significant effect on improving nurse interns' knowledge and practice of triage, and total preventative behavior regarding COVID-19 level was significantly improved after the program phase. **Recommendations:** Publication and dissemination of the educational guidelines in emergency department service to improve nurse interns' performance about triage corona virus patients.

***Keywords: COVID-19 pandemic and Emergency units, Nurse Interns& Triage.***

## Introduction
In a hospital, the emergency department is one of the most important and vital departments as it is the first point of contact with the hospital for any type of patient who needs emergency assistance so the development of a quick triage system and strong triage knowledge among nurses interns is essential for providing the best possible treatment in emergency circumstances. A systematic triage approach in emergency rooms might have a significant influence on hospital patient care quality and the absence of adequate training is reflected in the low triage knowledge among nurse interns. **(Gandhi & Jothimani, 2019; Mbombi & Mothiba, 2020).**

In emergency rooms, triage is the process of prioritising patients for care (EDS). Triage's purpose is to identify patients with life-threatening or emergency conditions who can't wait to be examined, start appropriate interventions, and then assign the patient to the appropriate location within the emergency department. When a patient comes to the EDS for emergency care, the triage nurse is the initial point of contact. Triage nurses must employ a sophisticated cognitive process to make clinical choices since triage should be conducted by a particularly trained and experienced registered nurse. **(Zachariasse, et al., 2017& Phukubye, et al., 2019).** In situations where data is insufficient, fragmented, or unclear, the triage nurse must demonstrate critical thinking skills. Triage nurses' knowledge and expertise have been cited as critical factors in triage decision-making in hospitals all over the world. The triage nurse performs a rapid, focused assessment and assigns the patient a triage acuity level, which is a proxy estimate of how long the patient will have to wait for a medical examination and treatment. If the triage nurse allocates patients to the triage room wrongly, the outcome of clients admitted to the ED with major medical/surgical difficulties would be damaged. **(Kucewicz-Czech & Damps, 2020).**

Since the disease's emergence, several countries around the world have taken the required steps to regulate and prevent the spread of COVID-19. The World Health Organization produced COVID-19 recommendations and protocols, which have been adopted by many countries' health ministries. **(WHO, 2020a & Zhong, 2020)**. The indications and symptoms of COVID-19, as well as preventive and protective strategies, are all covered in these guidelines. The Centers for Disease Control and Prevention (CDC) reaffirmed that everyone should take precautions to protect themselves and others

from the disease, including proper hand washing, appropriate spacing, wearing personal protective equipment such as masks, proper coughing and sneezing protocols, isolation, decontamination, and disinfection of surfaces and equipment. (**Center for Disease Control & Prevention, 2020& Kampf, et al., 2020).**

The nurse interns' commitment to prevention controls, which is mostly impacted by knowledge, perception, and preventive behaviour against COVID-19, is critical to the success of the preventive measures applied (e.g., hand hygiene by using soap, water, and disinfectants, such as hand sanitizers). Adapting these preventive and control behaviors, on the other hand, necessitates enough information, correct perception, and positive performance from nurse interns. (**Albaqawi et al., 2020; The Centers for Disease Control & Prevention (CDC), 2021 & Gan, et al., 2021).**

## Significance of the study

Triage is a major element of emergency management in hospitals and clinical care systems, and it is used as a metric in emergency assessments. Even the best efforts of high-tech units and specialists may not help the patient's health in the hours or days after admission if the patient is not properly triaged and does not receive the necessary clinical treatment. **(Algaissi et al., 2020).** Also, Egyptian studies **(Al-Metyazidy, Elsayed, Diab, 2019)** recommended conduction of educational program for nurse interns during their internship year for equipping them with adequate knowledge to enhance their practice regarding triage especially during COVID 19 Pandemic. So; the present study was conducted for enhancing nurse interns` knowledge and practice regarding triage at emergency units during COVID 19 Pandemic.

**Aim of the work**

The study aimed to enhancing nurse interns` knowledge and practice regarding triage at emergency units during COVID 19 pandemic through fulfilling the following objectives:

1. Assess nurse interns' knowledge and practice regarding triage pre, post and follow up training program.
2. Assess nurses' knowledge regarding COVID-19 pandemic pre, post and follow up training program.
3. Assess nurse interns' preventive behaviors regarding COVID-19 pandemic pre, post and follow up training program.
4. Design and conduct an education program for nurse interns' about Triage at Emergency Units during COVID 19 Pandemic.

**Research Hypothesis:**

Nurse interns who participate in the triage program will have higher mean scores in knowledge, practice, and prevention behaviors related to the COVID-19 pandemic after training program in clinical practice than before.

## Subjects and methods

**Research design:**

To achieve the study's aim, a quasi-experimental research design was used

**Setting:**

The research was conducted in Benha University Hospital's emergency rooms, where nursing interns are trained. It was made up of five parts. The following is an example: (Medicine emergency, Surgery emergency, Accidents emergency, Pediatric emergency and Orthopedic emergency).

**Subjects:**

The study included all of the nurse interns (60). During the academic year 2020/2021, who was trained in the emergency units at Benha University Hospital were distributed as follows: (12) nurse interns in each emergency unit.

**Data Collection Tools:**

To collect the data for this study four tools were used**.**

**Intern Nurses` Personal Characteristics Sheet.**

It was developed by the researchers to assess nurse interns' personal characteristics as unit, age, gender, marital status, training courses on triage, attending training courses on COVID-19 pandemic.

**Nurse Interns` Knowledge Questionnaire.**

It consisted of two parts. **Part one:** The researchers developed it to assess nurse interns' knowledge about triage based on a literature review **(Ahmed, 2011; Fathoni, Songwathana, 2013; Khalil, 2014; Elgammal, 2015 & Mostafa, 2017)**. It consisted of 30 questions, 20 of which were multiple choice questions and ten of which were true or false questions. Triage concept and aim (3) questions, triage categories (4) questions, triage process (5) questions, vocabulary used in triage system (3) questions, applied use of colors in triage (8) questions, and role of nurse in triage (7) questions are among the six primary dimensions covered.

**Part two:** It was developed by the researchers based on related literatures **(Hou et al., 2020; Olapegba et al., 2020, Ewees, et al., 2020)** to assess nurses' knowledge regarding COVID-19. This tool consisted of 15 true and false questions; it included knowledge regarding signs and symptoms of Coronavirus infection (3) questions, mode of transmission (3) questions, incubation period (3) questions, risk factors (3) questions, complications and management(3) questions.

**Scoring system:**
Nurse interns` responses were graded with a (1) for correct answers and a (0) for incorrect answers. When total scores exceeded 80%, the nurse intern's knowledge level was considered satisfactory, and when total scores were less than 80%, it was considered unsatisfactory (80%). **(Ewees, et al., 2020)**

**Triage Practice Observational Checklist:**
It was developed by researchers following a review of literature. **(Ahmed, 2011; White et al., 2013 & Elsayed, et al., 2014)**. It was used to assess nurse interns' practice of triaging patients during clinical activities. It was made up of (fifty items) covering 5 basic phases of triage (assessment of triage, nursing diagnosis, nursing planning, nursing implementation and nursing evaluation): (1) Assessment of triage room [for availability of equipment, medication, supplies patient's safety] and Assessment of triage [patient identification, subjective evaluation and objective evaluation] (2) Nursing diagnosis and (3) Nursing planning and (4) Nursing implementation [general care and direct care] and (5) Evaluation [for progress of triage cycle]. It was used at various stages of the evaluation (pre-program, immediately post program).

**Scoring system:**
The scoring system for observation checklist, the items "not done" and "done" were scored "0" and "1", respectively. The item scores were summed up and converted to a percent score. If the percent score was 60 percent or more, the practice was rated satisfactory; if it was less than 60 percent, it was rated unsatisfactory.

**COVID-19Preventive Behavior Assessment Tool:**
This tool was developed by the researchers based on related literatures **(Taghrir, Borazjani & Shiraly, 2020; Saqlain et al., 2020 & Serwaa et al., 2020),** to assess preventive behaviors regarding COVID-19 pandemic among nurse interns when dealing with patients at emergency unit. This tool was composed of 19 items included hand washing practice (5) items, wearing personal protective equipment (5) items, disinfection practice (5) items and isolation precautions (4) items.

**Scoring system:**
Nurse interns` response was measured using five point Likert scale for each statement were responses ranged from 1-3 (3always, 2 sometimes, 1 rarely). The total score ranged from 19-57. The higher the score reflecting the higher level of preventive behavior among nurse interns. The nurse interns` preventive behavior was classified as good preventive behavior with total score percent 80% and more, or classified poor preventive behavior with total score percent less than 80%.

**Data collection procedure**

**Administrative approval:**
Through official letters written to the head of department detailing the study's aim, from Dean of Faculty of Nursing and the hospital director of Benha University Hospital, received official approval.

**Tool validity:**
A panel of specialists comprised of five experts from Nursing Administration Department and Medical Surgical Department at Faculty of Nursing Benha University reviewed and tested the content validity of the data collecting tools, and adjustments were made based on their feedback.

**Tool reliability:**
The Cronbach's Alpha test was used to assess the reliability of study tools. For the Nurse Interns` Knowledge Questionnaire and the Triage Performance Observational Checklist, COVID-19 Preventive Behavior Assessment Tool the estimated reliability was (r=0.924, 0.893, 0.901) respectively.

**Pilot study:**
The revised questionnaires were piloted with 10% of the subjects: (6) nurse interns from Benha University Hospital in March 2021 to assess the feasibility of the study and make any necessary adjustments. Furthermore, estimating the time needed to complete questionnaires, which ranged from 35 to 50 minutes. There were no changes made; nurse interns who participated in the pilot study were included in the study's main subjects.

**Field work:**
The research was conducted for six months, from the beginning of April 2021 until the end of September 2021, as follows: 1. **The pre-intervention period**, which lasted from the beginning of April 2021 to the end of May 2021, lasted around two months. It involved reviewing recent related literature in order to design data collection tools and prepare triage handouts. Prior to data collection, the study's aim was explained to the participants, and their agreement to participate in the study was also acquired. Nurse interns were given the data collecting tools to complete on their own in order to assess their understanding of triage and determine their learning needs. The questionnaire took each participant about 25 minutes to complete. On the basis of the identified needs, teaching materials were developed and a training plan was devised. In addition, a timetable, instructional sessions, media, and a handout were developed.

**2. The intervention phase:** Nurse Interns training at Benha University Hospitals in emergency units were given the courses. First, according to their empty times, researchers divided nursing interns into (6) groups (10 nurse interns in each group). The program

sessions took place in the morning and afternoon shifts, starting in June 2021 and ending in July 2021. The program lasted for 12 hours distributed into four sessions and was held twice a week for each group, from 10 a.m. to 1 p.m. for morning shift and from 3 p.m. to 6 p.m. for afternoon shift. Each session lasted three hours, with two hours dedicated to theory and one hour to practice, case studies and scenarios. Lectures, group discussions, and brainstorming were all used as instructional approaches. The researchers prepared a handout that was given to all participants on the first day as part of the instructional material. Lessons for the programme were held at the Benha University Hospitals' training and development centre.

**3. The post-intervention phase (Evaluation Phase)**. The impact of the training programme was assessed in this step, which took place immediately after the programme was implemented; using the same data collection tools as in the previous phase. From the beginning of August 2021 until the end of September 2021, data was collected for two months.

**Ethical consideration:**

Prior to the conduction of the study, ethical approval was obtained from the scientific research committee at Faculty of Nursing, Benha University. All participants are interviewed for the purpose of explaining the study's goals and procedures, and they have the right to withdraw at any time during the study.

**Statistical Analysis:**

The statistical software for social science (SPSS) version 22 was used for data entry and analysis. Descriptive statistics in the form of tables and graphs were used to present the data (frequency, percentage, mean, the standard deviation, t. test). The correlation test (r) was performed. When $p \leq 0.05$, a significant level value was considered, and when $P \leq 0.001$, a highly significant level value was evaluated.

## Results

**Table (1): Frequency distribution of nurse interns regarding their personal characteristics (n=60).**

| Variables | | Nurse interns (60) | |
|---|---|---|---|
| | | No | % |
| **Age** | < 23years | 17 | 28.3 |
| | >23 years | 43 | 71.7 |
| | **Mean ± SD** | | **(23.89±1.76)** |
| **Gender** | Male | 22 | 36.4 |
| | Female | 38 | 63.3 |
| **Marital status** | Single | 52 | 86.7 |
| | Married | 8 | 13.3 |
| **Had taken Training Courses on triage** | Yes | 0 | 0.0 |
| | No | 100 | 100.0 |
| **Had taken Training Courses on COVID 19** | Yes | 18 | 30.0 |
| | No | 42 | 70.0 |

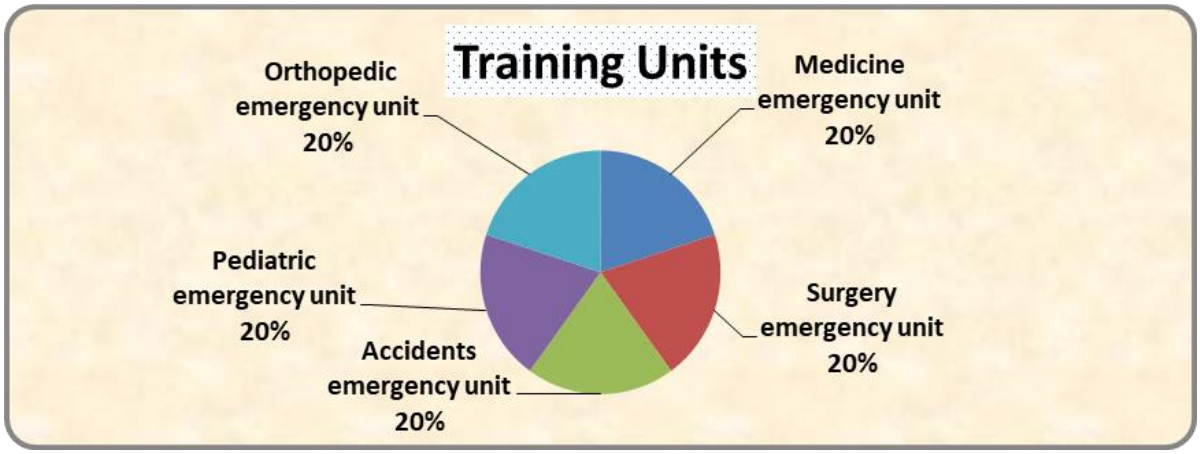


**Figure 1: Distribution of nurse interns according to their training unit (n=60).**

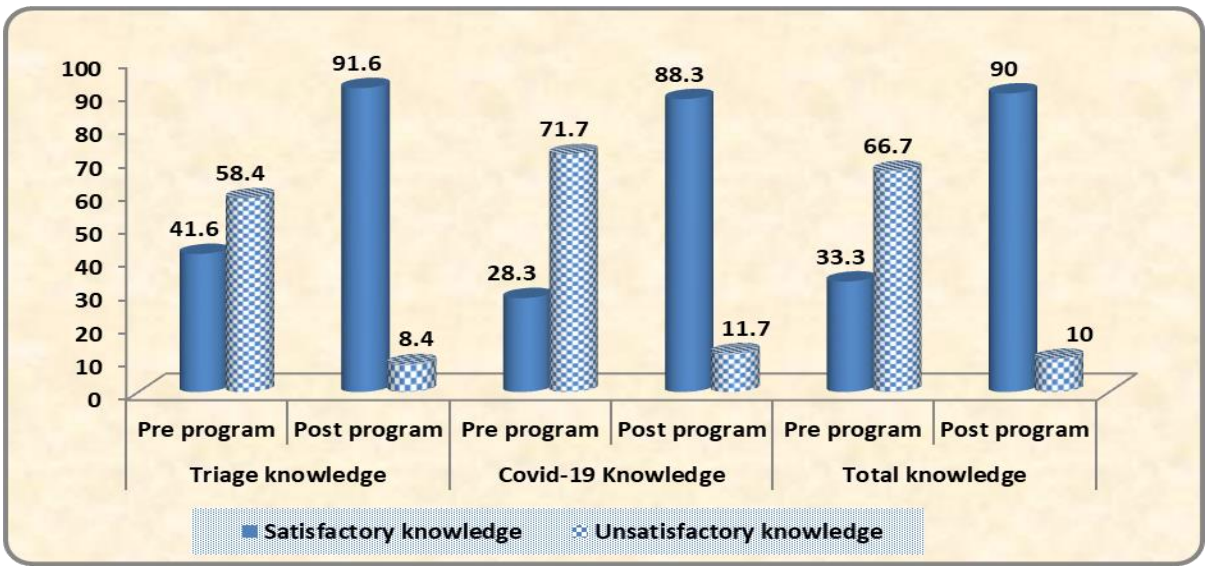


**Figure (2): Level of studied nurse interns' knowledge regarding in pre and post program (n=60)**

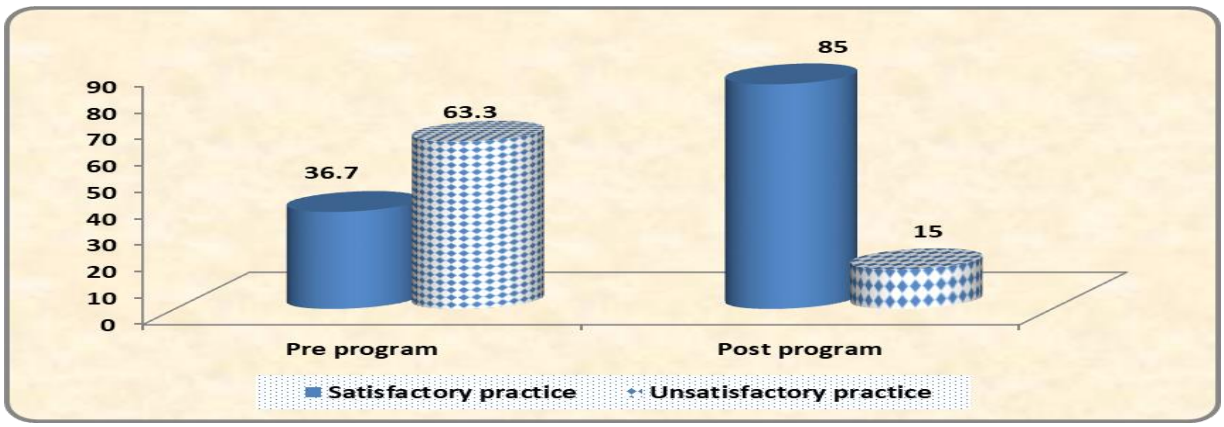


**Figure (3): Level of studied nurse interns' practice regarding triage in pre and post program (n=60)**

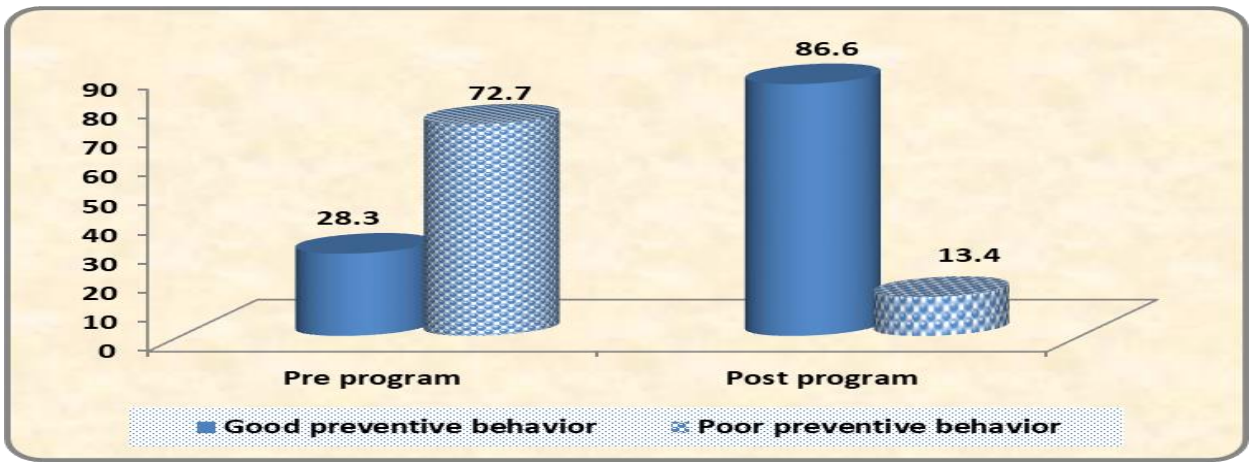


**Figure (4): Level of studied nurse interns preventive behaviors regarding COVID-19 pre and post program (n=60).**

**Table (2): Correlation between nurse interns' knowledge, practice, their preventive behavior level post program (n= 60).**

| Variables | Total knowledge score | | Total practice score | | Total preventive behavior score | |
|---|---|---|---|---|---|---|
| | r | P | R | P | r | P |
| **Total knowledge score** | 1 | | 0.894 | 0.000** | 0.770 | 0.000** |
| **Total practice score** | 0.894 | 0.000** | 1 | | 0.925 | 0.000** |
| **Total preventive behavior score** | 0.770 | 0.000** | 0.925 | 0.000** | 1 | |

*** Correlation is highly significant at the 0.01 level (2-tailed).*

**Table (1):** Showed that the total study sample was 60 nurse interns and more than two thirds of them (71.7%) were aged more than 23 years with Mean ± SD (23.89±1.76). And 63.3% & 86.7% of them were female and single respectively. And all of them and hadn't taken training courses on triage. And less than one third of them (30.0%) attended training courses on COVID 19**.**

**Figure (1):** Shows the distribution of nurse interns in emergency units based on their training unit. One-fifth (20%) of nurse interns were equally trained in medicine emergency units, surgery emergency units, accidents emergency units, pediatric emergency units, and orthopedic emergency units respectively.

**Figure (2):** Displays that before the program the two thirds of the study nurse interns (66.7%) had unsatisfactory knowledge level, while after the program implementation, the majority of the study nurse interns (90.0%) had satisfactory knowledge level. And there was statistically significant improvement in total nurse interns` knowledge regarding triage as (41.6%) of them had satisfactory knowledge level preprogram phase that improved to (91.6%) post program implementation. Also there was statistically significant improvement in total nurse interns` knowledge regarding Covid 19as (28.3%) of them had satisfactory knowledge level preprogram phase that improved to (88.3%) post program implementation.

**Figure (3):** Illustrates that before the program the less than two thirds (63.3%)of nurse interns had unsatisfactory practice level, while after the program implementation, the majority of the studied nurse interns (85.0%) had satisfactory practice level.

**Figure (4):** Demonstrates that before the program the less three quarters (72.7%)of nurse interns had poor preventive behavior level, while after the program implementation, the majority of the studied nurse interns (86.6%) had good preventive behavior level.

**Table (2):** Presents correlation between nurse interns' knowledge, practice, their preventive behavior level post program. The table showed that there was positive statistically significant correlation between total knowledge score and their practice level. There was statistically significant correlation between total their knowledge level and their preventive behavior level. Also, there was statistically significant correlation between total their practice level and their preventive behavior level post educational program.

## Discussion:

Triage is a response to the problem of overcrowding in emergency departments (EDs), and the accuracy of the triage unit's decisions has an impact on the emergency unit's final outcome, particularly during the COVID19 pandemic. Nurse interns should have the necessary training and experience in emergency nursing triage, decision-making, and emergency nursing care. As a result, during the COVID19 pandemic, employing experienced and skilled nurse interns for triage in emergency rooms, and teaching them how to properly do triage and implement preventive measures to prevent many infectious diseases. As a result, rigorous triage training improves the effectiveness of triage nurses' interns, as well as their confidence in their ability to work more efficiently. **(Kim & lee, 2020).**

The present study was conducted to enhance nurse interns` knowledge and practice regarding triage at emergency units during COVID 19 pandemic. The current study involved 60 nurse interns trained in emergency units at Benha University Hospital with personal characteristics; as more than two thirds of them were aged more than 23 years with Mean ± SD (23.89±1.76). And highest percentages of them were female, single and had general secondary school education respectively. All of them and hadn't taken training courses on triage. And less than one third of them attended training courses on COVID 19.

Concerning nurse interns' total knowledge regarding to triage two thirds of them had unsatisfactory knowledge level at preprogram phase, while after the program implementation; the majority of the study nurse interns had satisfactory knowledge level. Form researchers point of view this finding might be due to content of nursing curriculum related to triage system was insufficient to the nursing students preparation and not been enough provided with a comprehensive triage training system during the undergraduate study.

This finding was consistent with **Ahmed (2021)** revealed that there was significant improvement of knowledge about triage in post immediate program than preprogram among studied nurses. In the same line, this finding was in accordance with. **Sedky et al, (2019),** in their study, stated that more than two-thirds of the studied nurses' knowledge about triage was unsatisfactory before the program implementation. This knowledge level was significantly improved in the current study for most of them after program implementation, Also**, Mohamed (2017)** who reported that more than half of the studied nurse had unsatisfactory knowledge regarding triage.

This finding was in agreement with other studies, **Rahmani et al., 2013, Javadi et al., & Ebrahimi et al.,** (**2016**), they found that a high percentage of nurses had poor knowledge to triage. And **Tabatabai et al., (2015)** in their study concluded that the low awareness scores about triage highlighted the need for more supervision during internships, a focus on triage in university courses, and specialized triage training courses for students.

The current study finding was inconsistent with other studies **Aloyce et al. (2014), & Afaya et al., (2017)**, they reported that a high percentage of nurses were knowledgeable about triage at preprogram phase. Also, **Aghababaeian et al., (2017) & Asgari et al., (2018)** found that nurses' triage knowledge was at a moderate level.

Also, there was statistically significant improvement in total nurse interns` knowledge regarding COVID-19. Moreover, this improvement which indicated to positive effect on improvement of nurse interns' knowledge level regarding to triage and COVID19 after the program implementation. This improvement could be due to simple, clear and concise way presentation of training program and availability of media that gave more illustration for understanding the text and motivating them to share in the program.

This finding consistent with **Hua et al., (2020)** in their study reported that completion of the COVID-19-related training programme was connected with a higher total knowledge score. This finding was in line with the findings of other studies.

Regarding to nurse interns' total practice regarding to triage less than two thirds of nurse interns had unsatisfactory practice level at preprogram phase, while after the program implementation; the majority of the studied nurse interns had satisfactory practice level. From researchers perspective this finding might be due to their deficient knowledge, absence of orientation for nurse intern and lack continuous education and training about triage. In addition, unavailability of resources, and insufficient materials, equipment in most governmental hospitals. Plus, overcrowding in governmental hospitals emergency departments, which lead to an increase in the workload on nurses caring for such COVID 19 patients that result in inappropriate nursing care. This explanation emphasized by the current study cleared that studied nurse interns not taken training courses about triage and COVID19 pandemic.

This finding was agreed with **Faheim etal., (2019)** were reported the most of the studied nurses had incompetent level of triage practice before the program implementation, which improved for most of them to have competent practices immediately post-program implementation.

In the same line, this finding reinforced by a recent study done by **Reisi etal., (2018),** who detect a low-level knowledge score among emergency nurses employed in triage. Also, supported with **Ebrahimi et al., (2016***)* were found that, the performance of triage nurses in the identification of triage level before training on emergency severity index (ESI) was more than two fifth of them accuracy before the intervention and improved to the majority of them after training in Khatam-al-Anbia Hospital (Iranshahr).

This finding was disagreed with **Haghdust, et al., (2010)** who reported comparable findings as the studied nurses showed moderate to excellent performance before training, but none of the participant exhibit poor performance after training. In the same line, **Aloyce, et al., (2014),** who indicated that the satisfactory level of triage nurses' skill was 52% before triage education in a study conducted in Dar Es Salaam, Tanzania. A similar result reported by **Kerie et al., (2018*),*** who stated that greater than half of the nurses had a moderate level of triage skills before training in a study conducted in Addis Ababa, Ethiopia.

As regard to nurse interns` preventive behaviors level regarding COVID-19 in pre and post program. The result indicated that before the program less three quarters of nurse interns had poor preventive behavior level, while after the program implementation, the majority of the studied nurse interns had good preventive behavior level. From researchers' point of view this might be due to the most of studied nurse interns' lack of knowledge and training courses about COVID 19 pandemic regarding to severity, routs of transmission and preventive measures affect their preventive behaviors and training program succeeded in improving nurse interns` preventive behaviors.

This finding was in accordance with **Liu, et al., (2020)** who found about two-thirds of the healthcare subjects reported that they were not prepared to manage triage patients during COVID-19 and also had unsatisfactory level of preventive behavior assessment. Moreover**, Bhagvathula, et al., (2020)** were conducted study during the early stage of the

pandemic revealed that healthcare workers include (medical doctors, interns, nurses, midwives) had insufficient knowledge and practice about COVID-19 pandemic to protect themselves from corona virus infection.

This finding was agreed with **Lai, et al., (2020)** he majority of study participants reported using a facemask, hand washing for at least 20 seconds, covering mouth and nose when coughing and sneezing, and avoiding touching eyes, nose, and mouth with unwashed hands as much as possible after receiving training in the prevention of COVID 19 infection. In addition, the potential risk of COVID-19 has significantly improved infection prevention and control behaviours among hospital staff.

Also, **Abdel Wahed, et al., (2020)** were revealed that in a study conducted in Egypt, the most widely recognized preventive measures among health workers were hand washing, refraining from touching eyes, mouth, and nose, and wearing a surgical facemask. **WHO (2020b)** advises healthcare professionals to employ primary preventive measures including as hand washing, physical separation, and respiratory hygiene (covering mouth and nose while coughing or sneezing) to prevent the virus from spreading among themselves and their patients' close contacts.

Regarding to correlation between nurse intern's knowledge, practice, and their preventive behavior level post program. The total knowledge score and their level of practice had highly statistically significant positive correlation. This finding could be due to increased knowledge and practice of triage as a result of job exposure, as well as attending a triage training programme in the ED and access to internet resources for nursing interns' students.

This result was consistent with **Sahu, et al., (2020)** who demonstrated enhanced triage knowledge, skills and preventive measures of the multidisciplinary staff after participation in training program. The baseline knowledge and skill scores including the self-reported confidence level of the staff for triaging and protected airway management for COVID-19 were low. And **Palko and Xiang (2020)** who found positive impact of education on knowledge and performance of nurses and improvement in qualitative index of emergency department continued nursing education and practical triage are suggested for all personnel engaged in the emergency departments especially during COVID 19.

This result was agreed with **Rahmati, et al., (2013),** who found that the level of knowledge and practice in triage after the intervention was higher than before training with statistically significant differences between phases of program evaluation in a study conducted in Vali Asr Hospital of Fasa University of Medical Sciences. Also, **Weihai** (**2012**) showed that the level of knowledge and practice in triage and preventive measures during COVID 19 after intervention was higher than before training program.

This finding disagreed with **Duko et al., (2019)** concluded that there was no substantial relationship between experience and triage decision making in triage skill, according to four research. The capacity to do triage may be the same for both experienced and inexperienced emergency nurses.

Also, there was highly statistically significant positive correlation between total their knowledge level and their preventive behavior level. Also, there was statistically significant correlation between total their practice level and their preventive behavior level post educational program. From the researchers' point of view, personal preventive measures depend on nurse interns' knowledge and practice level. This finding was consistent with **Erfani, et al., (2020)** were found that positive correlation between total their practice level and their preventive behavior level post educational program

## Conclusion:

Based on the results of the present study, it can be concluded that: Implementing the training program had a significant effect in improving nurse interns' knowledge and practice of triage, as well as total preventative behavior regarding COVID-19 level during the post-program phase. There was a highly statistically significant positive correlation between total knowledge, total practice regarding triage, and total preventative behavior regarding COVID-19 among nurse interns' post-program scores.

## Recommendations:

The study's findings recommended that:

1. Publication and dissemination of the educational guidelines in emergency department service to improve nurse interns' performance about triage corona virus patients.
2. Establish formal units-based triaging training programs that will help to improve emergency nurse interns' knowledge and skills about used preventive measures during COVID 19 in ED
3. There is a constant need to foster and sustain the improvements in practices regarding triage in ED through the orientation and training for nurse interns during COVID19.
4. Increase preparedness and commitment regarding prevention and control of COVID-19 among nurse interns.

**For further studies:**

1. A comparison of the quality of patient triage in the emergency department by nurses, physicians, and emergency medical technicians.

**2.**Conducting educational workshops to increase the perceived efficacy of protective practices against COVID-19 among health care personnel.

## References


- **Abdel WY, Hefzy EM, Ahmed MI & Hamed NS. (2020):** Assessment of Knowledge, Attitudes, and Perception of Health Care Workers Regarding COVID-19, A Cross-Sectional Study from Egypt. J Community Health. 2020 Jul 7:1–10. pmid:31372797
- **Afaya, A., Azongo, T., & Yakong, V. (2017):** Perceptions and Knowledge on Triage of Nurses Working in Emergency Departments of Hospitals in the Tamale Metropolis, Ghana, IOSR Journal of Nursing and Health Science (IOSR-JNHS), Volume 6, Issue 3 Ver. VI (May - June 2017), PP 59-65.
- **Aghababaeian H, Sedaghat S, & Taheri N, (2017):** Evaluating knowledge and performance of emergency medical services staff regarding pre-hospital triage; 4(2):63-7.
- **Ahmed, H. (2011):** Effect of an Educational Intervention Program on Emergency Department Triage Nurses, Psychological Empowerment and Decision Making Ability in a Military Hospital. Master Thesis in Nursing Administration. Military Institute of Health and Epidemiology, Military Medical Academy.
- **Ahmed, M., (2021):** Triage training program and its effect on nurses decision making ability. Doctorate thesis not published. P. 90-95.
- **Albaqawi, H. M., Alquwez, N., Balay-odao, E., BajetJ, B., , Alabdulaziz, H, Tumala R. AlsharariA, F. ,Tork, H, Felemban, E,M., & Cruz, J, (2020):** Nursing Students' Perceptions, Knowledge, and Preventive Behaviors Toward COVID-19: A Multi-University Study. Front Public Health. 8: 573390.https://www.ncbi.nlm.nih.gov/
- **Algaissi, A., Alharbi, K., Hassanain, M., & Hashem, A., (2020):** Preparedness and response to COVID- 19 in Saudi Arabia: Building on MERS experience. Journal of infection and public health
- **Ali S, Bernice C. Taverner S , Ghani M , Kussor M, & Naz S (2013):** Knowledge of triage among nurses in emergency units, Biomedica. 2013; 29 (4): 240-243
- **Al-Metyazidy H, Elsayed K & Diab S. (2019):** Relationship between Nurses' Knowledge, Practice and Accuracy of the Patients' Triage Acuity Level in the Emergency Department, International Journal of Novel Research in Healthcare and Nursing Vol. 6, Issue 2, pp: (1383-1398).
- **Aloyce, R., Leshabari, S., & Brysiewicz, P. (2014):** Assessment of knowledge and skills of triage amongst nurses working in the emergency centers in Dar es Salaam, Tanzania. Afr J Emerg Med, 4(1),14–8.
- **Asgari H, Omidi MR, & Omidi N. (2018):** Evaluating the disaster triage knowledge of nurses personnel in Public Hospitals of Ilam. Health in Emergencies and Disasters Quarterly; 4(1):37-42.
- **Bhagvathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, & Bandari DK. (2020):** Knowledge and Perceptions of COVID-19 Among Health care workers: A cross-sectional study. JMIR Public Health and Surveillance 2020, 6: e19160. pmid:32320381 View Article PubMed/NCBI Google Scholar
- **Center for Disease Control and Prevention Centers for Disease Control and Prevention. (2020):** Available online at: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html?CDC<uscore>AA<uscore>refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fprepare%2Fprevention.html, access @ 15-7-2021.
- **Centers for Disease Control and Prevention (CDC). (2021):** CDC updates COVID-19 transmission webpage to clarify information about types of spread 2020; Available at https://www.cdc.gov/media/releases/202 0/s0522-cdc-updates-covidtransmission.html. Accessed on 5/7/2021
- **Considine J, Botti M, & Thomas S. (2017):** Do knowledge and experiences have specific roles in triage decision-making? AccidEmerg Med, 2017; 14:722–6.
- **Duko, B., Geja, E., Oltaye, Z., Belayneh, F., Kedir, A., & Gebire, M. (2019):** Triage knowledge and skills among nurses in emergency units of Specialized Hospital in Hawassa, Ethiopia. cross sectional study. BMC Research Notes, 12:21https://doi.org/10.1186/s13104-019-4062-1Received: 21 November 2018 Accepted: 9 January 2019.
- **Ebrahimi, M., Ghanbarzehi, N., Gorgich, Z.G., Darban, F., & shirzadi, F. (2016):** The effect of triage training on the performance of triage nurses and emergency medical staff of Iranshahr. International Journal of Medical Research & Health Sciences, ISSN No: 2319-5886, 5, 9S:190-196.
- **Elgammal M. (2015):** Emergency department triage why and how. Saudi Med. Vol (35). N 8 . Pp:245-259.
- **Elsayed, N., Ahmed, E., & AbdElhamid, M. (2014):** The Expected Role of Triage Nurse in Emergency Reception of a University Hospital, in Egypt. Journal of Biology, Agriculture and Healthcare, Vol.4, No.16, 2014, 69-80.

- **Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A & Moghadami M. (2020):** Knowledge, Attitude and Practice toward the Novel Coronavirus (COVID-19) Outbreak: A Population-Based Survey in Iran. [Preprint]. Bull World Health Organ. E-pub: 30 March 2020. doi:http://dx.doi.org/10.2471/BLT.20.256651
- **Ewees, A., Abdelazem, E., & Elwakeel, S. (2020):** Knowledge, Risk Perception, Preventive Behavior and Emotional Regulation regarding COVID-19 among Nurses Working in Isolation Hospitals, Egyptian Journal of Health Care, 2020 EJH vol. 11 no. 4; pp. 190-211.
- **Faheim1, S.S., Ahmed, S.S., Aly, E. & Hegazy, S. M. (2019):** Effect of Triage Education on Nurses' Performance in Diverse Emergency Departments. Evidence-Based Nursing Research.1.(2).
- **Fathoni, M., & Songwathana, P (2013):** Relationships between Triage Knowledge, Training, Working Experiences and Triage Skills among Emergency Nurses in East Java, Indonesia, Nurse Media Journal of Nursing, 3, 1, 2013, 511- 525
- **Gan W, Lim J, & Koh D. (2021):** Preventing intra-hospital infection and transmission of COVID-19 in healthcare workers. Saf Health Work. 2020;11(2):241–243. doi:10.1016/j.shaw.2020.03.001
- **Gandhi, S., & Jothimani, K. (2019):** A Study to Evaluate Effectiveness of Triaging the Triage: Reducing Waiting Time to Triage in the Command Post to Emergency Department in Selected Hospitals, International Journal of Nursing Education, October-December 2019, Vol.11, No. 4, pp: 149-155.
- **Haghdust, Z., Safari, M., & Yahyavi, H. (2010):** Effect of training on knowledge, attitude and practice of triage nurses in emergency hospital Poursina. Guilan. Nursing and Midwifery, 20(64), 14–21. [Google Scholar]
- **Hou, Z., Du, F., Jiang, H., Zhou, X., & Lin, L. (2020):** Assessment of public attention, risk perception, emotional and behavioral responses to the COVID-19 outbreak: social media surveillance in China. Risk Perception, Emotional and Behavioral Responses to the COVID-19 Outbreak: Social Media Surveillance in China (3/6/2020).https://www.medrxiv.org / content/ 10.1101 / 2020.03.14. 20035956v1
- **Hua F, Qin D, Yan J, Zhao T & He H (2020):** COVID-19 Related Experience, Knowledge, Attitude, and Behaviors Among 2,669 Orthodontists, Orthodontic Residents, and Nurses in China: A Cross-Sectional Survey. Front. Med. 7:481. doi: 10.3389/fmed.2020.00481
- **Islam MS, Rahman KM, Sun Y, Qureshi M, Abdi I, &Chughtai A. (2020):** Current knowledge of COVID-19 and infection prevention and control strategies in healthcare settings: A global analysis. Infect Control HospEpidemiol. 2020;41(10):1196–1206. doi:10.1017/ice.2020.237
- **Javadi S, Salimi T, & Sareban MT, (2016):** Knowledge and practice of nurses regarding patients' triage in emergency department. Iranian Journal of Emergency Medicine; 3(1):15-22
- **Kampf G, Todt D, Pfaender S, & Steinmann E. (2020):** Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect. 2020 Mar;104(3):246-251. doi: 10.1016/j.jhin.2020.01.022.
- **Kerie, S., Tilahun, A., & Mandesh, A. (2018):** Triage skill and associated factors among emergency nursesin Addis Ababa, Ethiopia. a cross-sectional study.BMC Research Notes, 11, 658, https://doi.org/10.1186/s13104-018-3769-8.
- **Kim, S., & Lee, J. (2020):** Walk-through screening center for COVID-19: an accessible and efficient screening system in a pandemic situation. *J Korean Med Sci.* ;35:e154.
- **Khalil, N. (2014):** Identifying The Expected Role Of Triage Nurse In Emergency Reception. Master Thesis in Nursing Science, Faculty of Nursing, Cairo University.
- **Kucewicz-Czech E, & Damps M. (2020):** Triage during the COVID-19 pandemic, National Library of Medicine 52(4):312-315.
- **Lai X, Wang X, & Yang Q, (2020):** Will healthcare workers improve infection prevention and control behaviors as COVID-19 risk emerges and increases, in China? Antimicrob Resist Infect Control. 2020;9(1):1–9. doi:10.1186/s13756-020-00746-1
- **Lai X, Wang X, Yang Q, Xu X, Tang Y, & Liu C, (2020):** Will healthcare workers improve infection prevention and control behaviors as COVID-19 risk emerges and increases, in China? Antimicrob Resist Infect Control 2020, 9:83. pmid:32527300
- **Liu Q, Luo D, Haase JE, Guo Q, Wang XQ, & Liu S, (2020):** The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. Lancet Glob Health 2020; 8:e790–98, Published Online April 29, 2020 pmid:32573443.
- **Mohammed A., (2017):** Nurses' knowledge regarding Triage in Omdurman Teaching Hospital, Omdurman locality, Khartoum state, Sudan (2016) Published Doctoral dissertation, University of Gezira. 2017.
- **Mbombi, T., & Mothiba, M. (2020):** Strategies to Enhance Knowledge and Practical Skills of Triage amongst Nurses Working in the Emergency Departments of Rural Hospitals in South Africa. Int.

J. Environ. Res. Public Health 2021, 18, 4471. https:// doi.org/10.3390/ijerph18094471

- **Mostafa S. (2017):** Assessment of Staff Nurse's knowledge and Performance Regarding Triage, Master Thesis in Nursing Science, Faculty of Nursing, Ain Shams University.
- **Olapegba, P., Iorfa, S., Kolawole, S., Oguntayo, R., Gandi, J., Olusola, F., & Ayandele, A. (2020):** Survey data of COVID-19- related Knowledge, Risk Perceptions and Precautionary Behaviour among Nigerians. Data in Brief, 105685. https://doi.org/10.1016/ j.dib .2020.105685
- **Palko H, & Xiang W-N. (2020):** In fighting common threats, people's deep commitment to taking collective action matters: examples from China's COVID-19 battle and her other combats. Socio-Ecol Pract Res. 2020;2:257–264. doi:10.1007/s42532-020-00056-1
- **Phukubye, T., Mbombi, M., & Mothiba, T. (2019):** Knowledge and Practices of Triage Amongst Nurses Working in the Emergency Departments of Rural Hospitals in Limpopo Province, The Open Public Health Journal, 2019, Volume 12, pp. 439-448.
- **Rahmati, H., Azmoon, M., Meibodi, M., & Zare, N. (2013):** Effects of Triage Education on Knowledge, Practice and Qualitative Index of Emergency Room Staff: A Quasi-Interventional Study. Journal of Bull Emerg Trauma 1(2): 69–75.
- **Reisi, Z, Saberipour, B., Aienh, M., Hemmatipour, A., & Shahvali, E. (2018):** The level of awareness of emergency department nurse of the triage principles in teaching hospital. Journal of Nursing and Midway Science, 5(1), 32-37.
- **Sahu K., Mishra A., & Lal A. (2020):** India fights **back**: COVID-19 pandemic. Heart Lung. 2020;49:446–448.
- **Saqlain, M., Munir, M., Ur Rehman S., Gulzar A, Naz S., Ahmed Z., Tahir A., & Mashhood M. (2020):** Knowledge, attitude, practice and perceived barriers among healthcare professionals regarding COVID-19: A Cross-sectional survey from Pakistan. medRxiv,. doi: 10.1101/2020.04.13.20063198
- **Sedky, S., Ahmed, S, Aly E., & Hegazy, S, (2019):** Effect of Triage Education on Nurses' Performance in Diverse Emergency. Evidence-Based Nursing Research.1 (2): 1-11.
- **Serwaa, D., Lamptey, E., Appiah, A., Senkyire, E., & Ameyaw, J. (2020):** Knowledge, risk perception and preparedness towards coronavirus disease-2019 (COVID19) outbreak among Ghanaians: A quick online cross-sectional survey. The Pan African Medical Journal, 35(44).
- **Taghrir, M., Borazjani, R., & Shiraly, R., (2020):** COVID-19 and Iranian Medical Students; A Survey on Their Related-Knowledge, Preventive Behaviors and Risk Perception. Shiraz, Iran. Arch Iran Med. April 2020; 23(4):249-254
- **Tabatabai A, Mohammad Nejad E, & Salari A.(2015):** Nursing students' awareness of triage in the emergency ward. *Jorjani*; 1(1): 30–4. Persian.
- **The Centers for Disease Control and Prevention (CDC). (2021):** Triaging Sick Patients. https://www.cdc.gov/
- **Weihai Y. (2012):** Principles of Emergency Management. Advances in Computer Science and Engineering. Advances in Intelligent and Soft Computing. 2012;141:581–5. [Google Scholar
- **White, L., Duncan G., & Baumle W., (2013):** Medical- Surgical Nursing, 3rd ed., Cangage learning international offices, Australia, p.1363-1369.
- **World Health Organization WHO (2020a):** Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected. World Health Organization: Geneva. https://www.who.int. 2020d. Accessed 11th September 2021.
- **World Health Organization (2020b):** Communicating risk in public health emergencies: A WHO guideline for emergency risk communication (ERC) policy and practice. World Health Organization.
- **Zachariasse JM, Seiger N, & Rood PP, (2017):** Validity of the Manchester Triage System in emergency care: A prospective observational study. PLoS One. 2017;12(2):e0170811. Published 2017 Feb 2. doi:10.1371/journal.pone.0170811
- **Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, & Li WT, (2020):** Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *Int J Biol Sci.* (2020) 16.