



Effectiveness of Self-instructional Module on Nurses' Performance Regarding Caring of Patient with Acute Respiratory Distress during Covid-19 Outbreaks

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ABSTRACT

The novel severe acute respiratory syndrome coronavirus-19 (SARS CoV-2 virus) infection and its clinical manifestation as coronavirus disease 2019 present an unparalleled worldwide public health problem. The disease introduces a unique pathophysiology and clinical course that puzzles the efficacy of the currently existing therapeutic approaches. **Aim:** to assess the effectiveness of self-instructional module on nurses' performance regarding caring of patient with acute respiratory distress during covid-19 outbreaks. **Design:** A quasi-experimental design was used. **Setting:** The study was conducted at intensive care units affiliated to El Hussein university hospital. **Subjects:** A purposive sample of nurses (60) was working in previously mentioned setting. **Data collection tools:** Nurses' structured self-administered questionnaire and nurses' practices observational checklist. **Results:** The present study revealed that, less than one quarter of the nurses had got satisfactory level of performance (knowledge & practice) regarding care of patients with acute respiratory distress and acute respiratory distress with corona virus infection and the studied nurses' competent level of practice from (24.3, 21.7 and 20.0%) at pre-implementation compared to (100.0, 100.0 and 98.3%) at post-implementation phase, respectively, with a highly statistically significant differences between pre/post at ($P < 0.01$). **Conclusion:** The implementing self-instructional module was inducing highly effective improvements in nurses' level of knowledge and practice regarding caring of patients with acute respiratory distress syndrome during Covid-19 outbreaks. **Recommendations:** Developing training courses about acute respiratory distress syndrome care that should be mandatory for newly employed nurses. Emerging a periodical evaluation, which determining nurses' needs and updating their knowledge and practice.

Keywords: Self-instructional Module, Covid-19 Outbreaks, Acute Respiratory Distress & Nurses' performance.

Introduction:

In December 2019, a group of patients with a unique coronavirus was identified in Wuhan, China. Initially tentatively named 2019 novel coronavirus (2019-nCoV), the virus is highly homologous to the coronavirus (CoV) that caused an outbreak of severe acute respiratory syndrome (SARS) in 2003; the virus has now been named SARS-CoV-2 by the International Committee of Taxonomy of Viruses (ICTV) and by the World Health Organization (WHO) on February 11,

2020, and the associated disease was named CoV Disease-19 (COVID-19) (WHO, 2020; Gorbalenya et al., 2020).

Acute respiratory distress syndrome (ARDS) is a life-threatening condition of seriously ill patients, characterized by poor oxygenation, pulmonary infiltrates, severe progressive dyspnea and hypoxemia, in the absence of any evidence of cardiogenic pulmonary edema, and acuity of onset, which progressively worsens within hours to days, frequently

requiring mechanical ventilation and intensive care unit-level care. The physical examination will include findings associated with the respiratory system, such as tachypnea, increased effort to breathe and chest auscultation usually reveals rales. Systemic signs depend on the severity of illness, such as central or peripheral cyanosis resulting from hypoxemia, tachycardia, and altered mental status. Etiology includes sepsis, inhalation of harmful substances, severe pneumonia, coronavirus disease 2019, other major injuries (Head, chest) and pancreatitis, massive blood transfusions, and burns (Sedhai et al., 2021; Diamond et al., 2021).

COVID-19 is an infectious respiratory disease that causes flu-like symptoms and is spread by droplets from the coughs or sneezes of infected persons. The incubation period is generally 14 days, after which COVID-19 symptoms, including fever, cough, fatigue, anorexia, shortness of breath, and myalgia appear (Cai et al., 2020; Peeri et al., 2020). The disease affects all age groups, but adults and persons with medical comorbidities are more affected. In addition, the nurses' workloads increase owing to the complexity of care required for patients with COVID-19 during outbreaks. Therefore, nurses can experience challenges in nursing practice that are related to procedures, direct patient care, evidence-based decisions, setting priorities, mentoring, and teaching patients and their families (Alsolami, 2021).

The novel severe acute respiratory syndrome coronavirus-19 (SARS-CoV-19 or SARS-CoV-2 virus) infection and its clinical manifestation as coronavirus disease 2019 present an unparalleled worldwide public health problem. The disease introduces a unique pathophysiology and clinical course that puzzles the efficacy of the currently existing therapeutic approaches. Patients were immediately admitted to the

isolation and received supplemental oxygen, given antiviral therapy; moxifloxacin to prevent secondary infection, methylprednisolone was administered to attenuate lung inflammation (Casella et al., 2021).

Subsequently, after receiving medication, his body temperature reduced. However, the serious shortness of breath and hypoxemia, cough, and fatigue did not improve on day 12 of the illness. The chest x-ray showed progressive infiltrate and diffuse shadow in both lungs, promote ventilation-perfusion mismatch. If the hypoxemia and shortness of breath worsened, ventilator support was needed on day 14 of the illness (Xu et al., 2020; Marini, Gattinoni, 2020). Coronavirus disease 2019 (COVID-19) is a serious illness caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and in severe cases associated with acute respiratory distress syndrome (ARDS). COVID-19 patients with ARDS presented with lymphopenia, increased thrombotic activity, increased CRP, LDH, and ferritin levels (Doghish, 2021).

Acute respiratory distress syndrome (ARDS), a complication commonly found in patients infected with the Coronavirus-19, which is a critically severe disease caused by pulmonary infection by the SAR-CoV-2 virus. Therefore, increased severity of the condition causes pulmonary inflexibility, which leads to hypoxia, a major cause of death. It is necessary, for nurses to have a proper understanding of the disease, treatment direction, concerning pathological mechanisms, characteristics, and severity of acute respiratory distress syndrome in patients infected with the Coronavirus-19. Moreover discusses treatment and caregiving methods, which include administration of virus multiplication inhibitors, oxygen therapy, and artificial respiratory ventilation all of which are fundamental patient care principles aimed to maintain their respiratory function, oxygen perfusion, and reduction of symptomatic

severity, complications, and to ensure caregiving efficiency (Thanakijtummakul, 2021).

The ongoing coronavirus disease 2019 pandemic has swept all over the world, posing a great pressure on critical care resources due to a large number of patients needing critical care. The management of ARDS post to COVID-19 infection poses noteworthy medical, logistical and decent impasses. A comprehensive intervention include protection of medical personnel, etiological treatment, diagnosis and treatment of tissue and organ functional impairment, psychological interventions, immunity therapy, nutritional support, and transportation of critically ill COVID-19 patients are urgently needed from front-line experts in the field of intensive care (Shang et al., 2020; Giovanni et al., 2021).

The study highlights the experiences of nurses caring for acute respiratory distress patients during the Covid-19 outbreaks in early 2020. Concerns were expressed over the working environment, the supply and availability of adequate protective personal equipment, nurses' level of knowledge regarding caring of patients with acute respiratory distress during Covid-19 outbreaks and the quality of care which were able to deliver (Roberts et al., 2021). Nurses are the largest workforce within the healthcare system, integral to the management of a pandemic, delivering direct patient care and coordinating services (Jackson et al., 2020). This often includes performing Aerosol Generating Procedures (AGPs), which may place staff at high risk of exposure to the virus from water droplets which can then be inhaled throughout bronchoscopy, sputum induction, provision of high-flow nasal oxygen and manual ventilation (Trust UHBNF, 2020).

The pandemic of Coronavirus disease 2019 has brought substantial pressure on nurses comprehensively as they are the frontline of care. This study aimed to

explore the experiences and challenges of nurses who worked with hospitalized patients with COVID-19. The learning needs of nurses included skills related to donning and doffing PPE and skills in performing nursing procedures. Nurses can perform an essential role in the COVID-19 care through paying special attention to expanding training opportunities as well as support mechanisms and counselling services for nurses (Rathnayake et al., 2021). The majority of patients admitted to the ICU because of acute hypoxemic respiratory failure that required respiratory support. Endotracheal intubation and invasive mechanical ventilation were needed in 88% of the patients, whereas only 11% could be managed with noninvasive ventilation (Guan et al., 2020; Huang et al., 2020; Grasselli et al., 2020).

The self-instructional module (SIM) is one of the latest innovations in the educational system which enables nurses to participate actively in the learning process. The self-instructional module is a learning resource that is prepped with pre-specified objectives, which involve the teaching of learning materials essential for the learning of specific topics, employing different types of media and having specific steps addressed to the learners, ranging from objectives to evaluation. In addition, the self-instructional module permits nurses to be an active participant in the learning process (Oshi et al., 2020; Deep, Chaudhary & Chacko, 2021).

The self-instructional module (SIM) is formed of the following items; title, overview, target nurses, instructional objectives (the knowledge and practice), pretest, learning activities and posttest. Evaluation phase is a systematic and continuous process to determine if the self-instructional module has fulfilled and nurses have been achieved and communicate the

expected positive outcomes and quality of care (Oshi et al., 2020; Dayalal, Kaushal & Arazu, 2021).

Significance

Nurses are the largest group of healthcare workers on the front line of efforts to control the COVID-19 pandemic. An understanding of their nursing experiences, the challenges they encountered and the strategies they used to address them may inform efforts to better prepare and support nurses and public health measures when facing a resurgence of COVID-19 or new pandemics (Chau et al., 2021; Cascella et al., 2021). COVID-19 is a novel infectious disease caused by a single stranded RNA coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In Egypt, from 3 January 2020 to 5:45pm CEST, 22 October 2021, there have been 321,084 confirmed cases of COVID-19 with 18,105 deaths, reported to WHO. As of 17 October 2021, a total of 23,177,181 vaccine doses have been administered (World Health Organization, 2021).

On 30 January 2020, the World Health Organization declared the novel severe acute respiratory syndrome coronavirus-2 to be a Public Health Emergency of International Concern. Egypt is among the five countries reporting the highest number of cases in Africa. However, the incidence proportion has increased to 14 cases /100 000 population (Radwan, 2020). Additionally, research has revealed that asymptomatic and pre-symptomatic infections are important contributors to the transmission of SARS-CoV-2 in populations. In Egypt, the true prevalence of infections is veiled due to the low number of screening tests (Girgis et al., 2021).

Aim of the study: This study was conducted with an aim to assess the effectiveness of self-instructional module on nurses' performance regarding caring of

patient with acute respiratory distress during covid-19 outbreaks, through the following:

1. To determine the existing knowledge of nurses regarding caring of patients with acute respiratory distress during covid-19 outbreaks
2. To determine the existing practice of nurses regarding caring of patients with acute respiratory distress during covid-19 outbreaks
3. To develop a SIM on caring of patients with acute respiratory distress during covid-19 outbreaks
4. To find out the effectiveness of SIM on nurses performance regarding caring of patients with acute respiratory distress during covid-19 outbreaks

Research hypothesis:

H1. The studied nurses will have a statistically significant perfection of the knowledge level regarding the acute respiratory distress during covid-19 outbreaks at post the self-instructional module implementation compared to pre-implementation.

H2. The studied nurses will have a statistically significant improvement of the practices level regarding caring of patients with acute respiratory distress during covid-19 outbreaks at post the self-instructional module implementation compared to pre-implementation.

Operational definitions:

The self-instructional module; Set of prepended objective (the knowledge and practice) for specific topics and target nurses, which involve designing pretest, the learning materials and educational activities, then post-test to improve nurses' knowledge and practice level for optimization of quality of care provided post implementation.

Research design: Quasi-experimental research design with was used to conduct this study. An

experiment is a study in which the researcher operates the level of some independent variable and then measures the result. Experiments are potent methods for assessing cause-and-effect relations (Gopalan, Rosinger & Ahn, 2021).

Technical Design:

The technical design includes research setting, subjects and tools for data collection.

Setting: The study was conducted at (cardiac care unit, general care unit, stroke care unit and neurological care unit) in the 2nd floor at emergency structure, each unit contains one room with 4 bed and 6 nurses. Cardiac and chest care unit in 2nd floor at old structure, contains 2 rooms with 8 beds and 12 nurses. Chest unit 6th floor (contains one room with 4 beds and 8 nurses) and medical care unit in 7th floor (contains 3 rooms one pig room contains 10 beds and the other two small rooms each one contains 4 beds and 16 nurses) affiliated to El Hussein university hospital.

Subjects: A purposive sample comprised of (60) staff nurses (total population sampling) who met the inclusion criteria, working at previous mentioned setting affiliated to El Hussein university hospital and agree to participate in the study (Crossman, 2020).

Inclusion criteria: staff nurses who are

- Willing to participate in the study
- Available at the time of study.
- Working previously with patient had respiratory distress syndrome.

Tools for data Collection:

Data for this study were collected using the following tools:

- A-** A Nurse structured interviewing questionnaire:
An Arabic questionnaire, based on recent

literature was developed by the researcher, It included the following parts:

Part I: Demographic characteristics of nurses under study as regards to age, gender, marital status, level of education and position, experience year, working hours and training courses.

Part II: Nurses' knowledge questionnaire: as regards to assess nurses' knowledge regarding respiratory distress syndrome and coronavirus infection (ARDS-CoV-2) (pre/post). It included two main sections.

Section I: Nurses' knowledge regarding respiratory distress syndrome (pre/post): This questionnaire was designed by the researchers' in Arabic language after reviewing the related literature. The items on this sheet were adapted from Park (2020) and Park, Thwaites and Peter (2020), it included 9 items (Definition, how long does it last to worse, causes, the hallmark sign, diagnostic criteria, the chance of surviving, differential diagnosis, treatment and complications of acute respiratory distress syndrome)

Section II: Nurses' knowledge regarding acute respiratory distress with coronavirus infection (ARDS-CoV-2) (pre/post): This questionnaire was designed by the researchers in Arabic language after reviewing the related literature. The items on this sheet were adapted from Abdollahi et al. (2020), it included 4 mean dimensions (Nature of the disease (9 items), transmission of the disease (3 items), actions in dealing with suspected, probable and confirmed cases (19 items), precautionary

measures by health care providers (6 items), treatment of the disease (5 items)).

Scoring system: The total score of nurses' knowledge was equal 51; (1) grade were given to the correct answer and (zero) to the incorrect answer. Total score was considered as the following:

- $\geq 80\%$ was considered satisfactory level of knowledge (> 41 grades correct answer).
- $< 80\%$ was considered unsatisfactory level of knowledge (< 41 grades correct answer).

B- Nurses' practical observational checklists: It were adopted from Li, Chen and Li, (2012) to evaluate an effectiveness appraisal form for assessing adult invasive mechanical ventilation systems (EAP-AIMVS), and to apply it for measuring the effectiveness of nursing staff in establishing artificial airways and helping to wean patients from mechanical ventilation based on the American Weapons Systems Effectiveness Industry Advisory Committee (WSEIAC). The observational checklists were composed of three main dimensions: (Availability dimension (5 items), dependability dimension (12 items), and capability dimension (5 items).

Scoring system: The total score of practice observational checklists was equal 22; (1) grade were given to the step which was done correctly and (zero) to the step which was done incorrectly or not done. Total score was considered as the following:

- $\geq 80\%$ was considered competent level of practices (≥ 18 correct actions).
- $< 80\%$ was considered incompetent level of practices (< 18 correct actions).

Development of Self-instructional Module: A self-instructional module was developed for the staff nurses. It was prepared based on analysis of pre-test knowledge score, review of literature and discussion with the guide and other experts, development of criteria checklist, preparation of the first draft and apply content validity of self-instructional module then preparation of the final draft. The self-instructional module divided into three chapters;

Chapter I: It included knowledge regarding respiratory distress syndrome (Definition, how long does it last to worse, causes, the hallmark sign, diagnostic criteria, the chance of surviving, differential diagnosis, treatment and complications of acute respiratory distress syndrome).

Chapter II: It included knowledge regarding acute respiratory distress with coronavirus infection (Nature of the disease, transmission of the disease, actions in dealing with suspected, probable and confirmed cases, precautionary measures by health care providers, treatment of the disease).

Chapter III: Nurses' practical checklist; an effectiveness appraisal form for assessing adult invasive mechanical ventilation systems (EAP-AIMVS)

Operational Design: It includes the preparatory phase, content validity of the modified tool and reliability, ethical consideration, pilot study and field work.

Preparatory Phase:

It included reviews of current and past available literature and theoretical knowledge of various aspects of the study using booklet, articles, internet, periodicals and magazines in order to develop the data collection tools

Content validity:

Content validity was conducted to test representative of all aspects of the study. To produce valid results, the content of a test and measurement method must cover all relevant parts of the topic it aims to be appropriate, relevant, correct, and clear (Middleton, 2021). The juries were five experts, from the medical-surgical nursing staff at the faculty of nursing, Helwan University. The juries were belonged to different academic categories (professors and assistant professors). Their opinions were expressed about the format of the tool, the layout, the consistency and the scoring system.

Testing reliability:

Reliability can be estimated by comparing different versions of the same measurement (Middleton, 2021). It tested by using Cronbach alpha test the reliability scores of study tools including Arabic version; the Cronbach alpha for internal consistency of knowledge related to respiratory distress syndrome and respiratory distress syndrome with CoV-19 infection were 0.925 and 0.943 respectively. The Cronbach alpha for internal consistency of practice related to the appraisal form was 0.957.

Pilot Study:

A pilot study was applied to a group of 10 nurses (10% of the sample) to test the applicability of the tools and clarity of the designed questionnaire, as well as to estimate the time needed to answer them. Nurses included in the pilot study were also included in the main study topics, as there were no changes in the tools.

Field Work:

This study was conducted through three phases: Assessment phase, self-instructional module implementation phase (Theoretical & practical stage) and evaluation phase:

I- Implementation phase

- This phase started by selecting nurses before self-instructional module implementation who met the inclusion criteria and explaining basically the aim and nature of the study as well as taking their approval to participate in the study prior to data collection.

- The structured interviewing questionnaire included demographic characteristics and the nurses' knowledge questionnaires were completed by the nurses. It took around 30 minutes to fill it out for each nurse.

- Nurses were observed by the researcher using practical observational checklists to assess their appraisal form, measuring the effectiveness of nursing staff in establishing artificial airways and helping to wean patients from mechanical ventilation. This method involves noting down what researchers see and what the nurses say about what is happening. It took every nurse a half-hour.

- Based on nurses' knowledge prerequisites, the researchers developed the self-instructional module in the Arabic language including the following contents: knowledge regarding respiratory distress syndrome (Definition, how long does it last to worse, causes, the hallmark sign, diagnostic criteria, the chance of surviving, differential diagnosis, treatment, and complications of acute respiratory distress syndrome) and knowledge regarding acute respiratory distress with coronavirus infection (ARDS-CoV-2) (Nature of the disease, Transmission of the disease, Actions in dealing with suspected, probable and confirmed cases, Precautionary measures by health care providers, treatment of the disease). The practical part was designed based on the American Weapons Systems Effectiveness Industry Advisory Committee (WSEIAC) for adult invasive mechanical ventilation systems for establishing artificial airways and helping to wean

patients from mechanical ventilation. Then apply validity for the self-instructional module.

-The Self-instructional module material was developed using text, images and flow diagrams in Microsoft PowerPoint Presentation. The educational material was uploaded by the department of the desktop computer facility, through an internet facility on their laptops and mobile to make it accessible to the nurses. The participants could have access to the module at a time in a sequential manner. The researcher posted in the unit motivated the nurses to complete the module.

- The self-instructional module was administered on the same day with the following instructions; keep the self-instructional module with them for 2 weeks. Read the self-instructional module thoroughly. Nurses were allowed to ask questions in case of misunderstanding while listening and expressing interest for them.

II- Evaluation phase: After the module was completed, the post-intervention evaluation was completed at the end of the program. The pre and post-intervention tests were individually monitored by the researcher. Following the implementation of the self-instructional module, all tools, except nurses' demographic data sheet, were re-funded 2 weeks after receiving the self-instructional module. Evaluate the effect of the self-instructional module on the nurses' knowledge and practice level to optimize the quality of care provided post-implementation.

- Data collections and the self-instructional module teaching for the sample of this study took about 4 months were conducted in the morning and afternoon shifts started from the beginning of February 2021 until the end of June 2021.

Administrative Design:

To complete the study, a letter of ethics approval was obtained from the recruitment hospital ethics boards. Verbal informed consent has been obtained from each included nurse; official letters were issued to them from the Faculty of Nursing – Helwan University explaining the aim of the study to obtain permission for the collection of data.

Ethical Considerations:

An oral consent was taken from nurses who agree to participate in the research process after the aim of the study has been simply explained to them prior to data collection. They were assured that anonymity and confidentiality would be guaranteed and that they would have the right to withdraw from the study at any time without giving a reason. Values, culture and beliefs would be adhered to.

Statistical Design:

The collected data were analyzed using (SPSS) version 24 (a total sample size of 60 nurses), to achieve a power of 95% and a level of significance of 5% (two-sided) (Dhand & Khatkar, 2014). Qualitative data were presented as number and percent, paired sample t-test. Relations between different qualitative variables were tested using correlation coefficient (person correlation). Probability (p -value) ≤ 0.05 was considered significant and < 0.001 was considered highly significant. While, > 0.05 was considered non-significant

Results

Table (I) The percentage distribution of demographic characteristics of nurses under the study illustrated that all of the study nurses were females. As well, 60% of the study nurses were between 20-30 years with a mean age (28.8 ± 4.91) years. As regards the nurses' educational level, 66.7% of the studied nurses had technical nursing education by means of 36.0% of the studied nurses had experienced less than 5

years, while 32.0% of them had 5-10 years and the same percentage had more than 10 years with the mean years of their experience were (5.49 ± 1.14) years. Additionally, 60% of the studied nurses had working hours with $(30 - < 42)$ per week. Concerning attending the training courses, all of the nurses attend training courses related to the COV-19 outbreak, while (81.7%) of them did not attend any training courses related to acute respiratory distress syndrome.

Table (2) Percentage distribution of the satisfactory level of nurses' knowledge regarding acute respiratory distress syndrome throughout pre/post phases; only (38.7, 35.5, 40.3, 33.9, 61.3, 43.5, 40.3, and 40.3%) of the study subjects gave correct answers regarding (definition of acute respiratory distress syndrome, how long does it to worse, causes, the hallmark sign, diagnostic criteria, the chance of surviving, differential diagnosis, treatment, and complications) at pre-implementation. Compared to (91.7, 95.0, 91.7, 91.7, 95.0, 93.3, 90.0, 90.0, and 91.7%) who had a satisfactory level of knowledge one month after instructional module implementation, respectively, with a highly statistically significant difference for pre/post phases at $p < 0.01$.

Table (3): Percentage distribution of the satisfactory level of nurses' knowledge regarding acute respiratory distress syndrome patients with coronavirus infection throughout pre/post phases displayed that, only (25.0, 48.3, 26.7, 30.0, and 31.7%) of the study subjects gave correct answers regarding (Nature of the disease, transmission, actions in dealing with suspected, probable and confirmed cases, precaution measures, and treatment of the disease) at pre-implementation compared to (96.7, 91.7, 100.0, 100.0, and 100.0%) who had a satisfactory level of knowledge one months after instructional module implementation,

respectively, with highly statistically significant differences for pre/post phases at $p < 0.01$.

Table (4): Percentage distribution of nurses' competent level of practice regarding adult invasive mechanical ventilation systems throughout pre/post phases validated that, there was improvement of the studied nurses' competent level of practice from (30.0, 46.7, and 36.7%) at pre-implementation compared to (95.0, 98.3, and 98.3%) at post-implementation phases, respectively, with highly statistically significant differences between pre/post at $(P < 0.01)$.

Figure (1): Percentage distribution regarding the total pre-post satisfactory level of knowledge and competent level of practice among study group subjects. showed that, there were improvement of the studied nurses' satisfactory level of knowledge regarding acute respiratory distress syndrome and acute respiratory distress syndrome with coronavirus-19 infection and the studied nurses' competent level of practice from (24.3, 21.7, and 20.0%) at pre-implementation compared to (100.0, 100.0, and 98.3%) at post-implementation phase, respectively, with highly statistically significant differences between pre/post at $(P < 0.01)$.

Table (5) Comparison of Mean scores among the study subject regarding total level of nurses' knowledge and practice throughout pre/post phases clarified that, there were improvement of the studied nurses' satisfactory level of knowledge and competent level of practice at pre/post phases, respectively, with highly statistically significant differences between pre/post at $(P < 0.01)$.

Table (6) Correlation between total level of nurses' knowledge and practice throughout pre/post phases revealed that there was a statically insignificant difference only between total level of studied nurses' knowledge and practice for pre-test on $(X^2 = 0.729)$ at P

> 0.05). While, there were highly statistically significant differences between the total level of studied nurses' knowledge and practice for pre-test and post-test phases on ($X^2=12.259$, 32.417, and 5.798 respectively) at $p < 0.01$.

Table (1): The percentage distribution of demographic characteristics of nurses under the study (n=60).

Item	Number	%
Gender		
Female	60	100.0
Male	0	000.0
Age (Years)		
20 - < 25	17	28.3
25 - < 30	19	31.7
30 - < 35	18	30.0
35 +	6	10.0
Mean ± SD	28.8 ± 4.91/ 2.22 ± .976	
Educational level		
Diploma of nursing	15	25.00
Technical Institute of nursing	40	66.7
Bachelor of nursing	5	8.3
Job categories		
Staff nurse	29	48.4
Charge nurse	21	43.3
Head nurse	5	8.3
Experience (Years)		
1 - < 5	1	36.0
5 - < 10	26	32.0
10 +	33	32.0
Mean ± SD	5.49 ± 1.14 / 1.85 ± .732	
Working hours		
30 - < 42	36	60.0
42 - < 48	18	30.0
> 48	6	10.0
Mean ± SD	45 ± 15/ 1.5 ± .68	
Training courses for acute respiratory distress syndrome		
No	0	81.7
Yes	11	18.3
Training courses for COV-19 outbreak		
No	0	0.0
Yes	60	100.0

Table (2): Percentage distribution of the satisfactory level of nurses' knowledge regarding acute respiratory distress syndrome throughout pre/post phases (no=60).

Nurses' Knowledge Assessment Items	Pre		Post		X2 test	
	Satisfactory		Satisfactory		Pre/post	
	no	%	no	%	X2	P
Definition of acute respiratory distress syndrome	22	38.7	55	91.7	6.626	0.000
How long does acute respiratory distress syndrome last to worse?	25	35.5	57	95.0	8.523	0.000
Causes of acute respiratory distress syndrome	25	40.3	55	91.7	6.825	0.000
The hall mark sign of acute respiratory distress syndrome	27	43.5	55	91.7	6.600	0.000
Diagnostic criteria of acute respiratory distress syndrome	21	33.9	57	95.0	8.604	0.000
The chance of surviving acute respiratory distress syndrome	27	43.5	56	93.3	6.825	0.000
Differential diagnosis of acute respiratory distress syndrome	38	61.3	54	90.0	4.671	0.000
Treatment of acute respiratory distress syndrome patients	25	40.3	54	90.0	6.825	0.000
Complications of acute respiratory distress syndrome	25	40.3	55	91.7	6.825	0.000

$P < 0.01$ High Significant, $P < 0.05$ Significant & $P > 0.05$ No significant

Table (3): Percentage distribution of the satisfactory level of nurses' knowledge regarding acute respiratory distress syndrome patients with coronavirus infection throughout pre/post phases (no=60).

Dimensions of knowledge	Pre		Post		X2 test	
	Satisfactory		Satisfactory		Pre/post	
	no	%	no	%	X2	P
Dimension 1: Nature of the disease	15	25.0	58	96.7	25.805	0.000
Dimension 2: Transmission of disease	29	48.3	55	91.7	12.259	0.000
Dimension 3: Actions in dealing with suspected, probable and confirmed cases	16	26.7	60	100.0	26.505	0.000
Dimension 4: Precaution measures	18	30.0	60	100.0	16.214	0.000
Dimension 5: Treatment of the disease	19	31.7	60	100.0	22.669	0.000

$P < 0.01$ High Significant, $P < 0.05$ Significant & $P > 0.05$ No significant

Table (4): Percentage distribution of nurses' competent level of practice regarding adult invasive mechanical ventilation systems throughout pre/post phases (no=60).

Effectiveness Appraisal form - Adult Invasive Mechanical Ventilation Systems items	Pre		Post		X2 test	
	Competent		Competent		Pre/post	
	no	%	no	%	X2	P
Factor 1: Availability	18	30.0	57	95.0	5.914	0.000
Factor 2: Dependability	28	46.7	59	98.3	23.610	0.000
Factor 3: Capability	22	36.7	59	98.3	16.528	0.000

$P < 0.01$ High Significant, $P < 0.05$ Significant & $P > 0.05$ No significant

Figure (1): Percentage distribution regarding the total pre-post satisfactory level of knowledge and competent level of practice among study group subject.

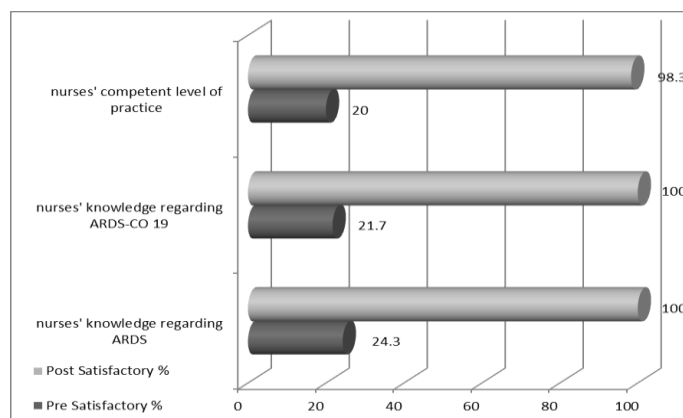


Table (5): Comparison of Mean scores among the study subject regarding total level of nurses' knowledge and practice throughout pre/post phases (no=60).

items	Pre- test	Post- test	X2 test		
			Pre/post		
	Mean ±SD	Mean ±SD	X2	P	r
Total knowledge	1.43 ± 0.89	1.87 ± 0.35	18.97	0.000	0.540
Total practice	1.45 ± 0.15	1.94 ± 0.11	16.23	0.000	0.258

$P < 0.01$ High Significant, $P < 0.05$ Significant & $P > 0.05$ No significant

Table (6): Correlation between total level of nurses' knowledge and practice throughout pre/post phases (no=60).

Total practice	Total knowledge			
	Pre			
	Mean± SD	r	X2	P
Pre-test	0.017± 0.18	0.100	.729	0.469
Post-test	0.51± 0.12	0.212	12.259	0.000
	Post			
	Mean± SD	r	X2	P
	Pre-test	0.42± 0.15	0.077	32.417
Post-test	0.074± 0.099	0.338	5.798	0.000

P < 0.01 High Significant, P < 0.05 Significant & P > 0.05 No significant

Discussion

In terms of the characteristics of the nurses involved in the study, the results of this study indicated that all the studied nurses were female. This is perhaps due to the largest nursing department in Egypt being female. These results were in same line with **Mohammad (2018)** in his study titled " Intensive care unit nurses' performance regarding caring patients with head injury: An educational intervention" documented that nearly two-thirds of intensive care unit nurses contributors in her study were females.

Related to age, the results of the present study revealed that, more than half of the study nurses' ages were between 20-30 years old. This is may be due to the greater ability of the younger nurses' to assume the workload on the critical care unit. The results of the present study agreed with **Hassan et al. (2018)** who study titled "Effect of educational program on nurses' practice regarding the care of adult patients with endotracheal tube" reported that more than half of the intensive care nurses aged between 20 - < 25 years.

As regards the nurses' educational level, about two-third of the studied nurses had technical nursing education. This may be due to the number of diploma schools have declined in the recent years due to a trend moving nursing education in the academic setting. This is in agreement with **Kroning (2014)**, whose study titled" The importance of integrating active learning in education. Nurse Education in practice" Reported that

the nurses in critical care unit have a need to improve their educational level.

This finding is not in the same line with **Abdullah et al. (2014)** their study titled "Nurses' knowledge and practices about the administration of medications via nasogastric tube among critically ill patients" mentioned that the majority of their study sample having a diploma education.

Regarding years of experience, the current study showed that more than one third of the studied nurses had experienced less than 5 years. This was in the same line with **Odhah, et al., (2021)** whose study about "Impact of video assisted teaching intervention on the critical care nurses' knowledge regarding extracorporeal membrane oxygenation" revealed that nurses under the study had an experience of less than 5 years. Also, **Tadros et al. (2019)** study titled " Effect of self-learning package on nurses' performance caring for patients on ventilators" showed that less than half of the studied nurses had experienced <5 years and one-quarter of them had experienced 5- <10 years.

Additionally, the study results revealed that about two-thirds of the studied nurses had working hours (30 - < 42) per week. This result was in the same line with **Lakshmikanthcharan, Sivakumar and Hisham. (2019)** their study titled " Stress and burnout among intensive care unit healthcare professionals in an Indian tertiary care hospital" survey revealed that western European countries had less than 42 working hours per week and an Indian study had more than 50 working hours per week. Also, the study results supported by **Cishahayo et al. (2017)** their study titled " Burnout among nurses working in critical care settings: a case of a selected tertiary hospital in Rwanda" their study results revealed that most of the participants had a high level of burnout among ICU and emergency department nurses

Concerning attending the training courses, the present study results revealed that all of the nurses attend training courses related to the COV-19 outbreak. This may be due to keeping them in contact with the new instructions, new line of treatment, mode of transmissions and any updating related to the new virus from WHO. While, more than three quarters of them did not attend any training courses related to acute respiratory distress syndrome. This might be due to the shortage of training courses related to this subject and shortage in time.

This result comes in agreement with **Zainib et al. (2017)** study titled " The Gap between knowledge and practices in standard endotracheal suctioning of intensive care unit nurses in Lahore Hospital's" results reported that about two-thirds of studied nurses, didn't attend any training courses.

The finding of the current study revealed that around one third of the studied nurses had a satisfactory level of knowledge regarding acute respiratory distress syndrome throughout pre-self-instructional module implementation related (definition of acute respiratory distress syndrome, how long does it to worse, cause, the hallmark sign, diagnostic criteria, the chance of surviving, differential diagnosis, treatment, and complications). This reflects insufficient continuous education and especially training session. In addition, this might be the majority of nurses hold technical degrees, not available of references and books if a theme has the book in the English language difficult nurses for reading because that not update of knowledge and sometimes lack staff orientation in the different intensive care unit. While, the satisfactory level was improved one month after instructional module implementation with a highly statistically significant difference for pre/post phases at $p < 0.01$. The improvements were generally sustained and

provided evidence of the effectiveness of the self-instructional module implementation.

These results were supported by **Odah et al., (2021)** their results revealed that nearly all of the intensive care unit nurse's unsatisfactory level knowledge before implementing the educational program. While, the implementation of the education program revealed the improvement of critical care nurse's knowledge score and level as regards acute respiratory distress syndrome concept definition, criteria, risk factors, cause, signs and symptoms, diagnosis, treatment, nursing care, and infection control.

These results are in agreement with those of **Abdou and Dogham (2016)** study titled "Impact of using simulation on critical care nursing students' knowledge and skills of acute respiratory distress syndrome" found that there were statistically significant differences between pre and post-test scores for students' knowledge and showed improvement in knowledge gain after application of simulation-based learning about ARDS.

The present study revealed that, around one third of the studied nurses had satisfactory level of knowledge regarding acute respiratory distress syndrome patients with coronavirus infection throughout pre self-instructional module implementation related (Nature of the disease, Transmission, Actions in dealing with suspected, probable and confirmed cases, Precaution measures and Treatment of the disease). While the satisfactory level was improved one month after self-instructional module implementation with highly statistically significant differences between pre/post phases at $p < 0.01$.

The present results were in agreement with **Thanakijtummakul (2021)** whose study titled

"Nursing care for covid-19 patients with acute respiratory distress syndrome" concluded that there is significant differences were observed in nurses' knowledge regarding "Nature, transmission, precaution measures and treatment of the disease". Also, the present result proved by **Roberts et al. (2021)** their study titled " Experiences of nurses caring for respiratory patients during the first wave of the CoV-19 pandemic" shows that nurses' knowledge can be increased by the implementation of a training program that will be ongoing and will be repeated at regular intervals based on the needs of staff.

The present study finding showed that less than half of the studied nurses had a competent level of practice regarding adult invasive mechanical ventilation systems throughout pre self-instructional module implementation. While, there were improvements in the studied nurses' competent level of practices at post-implementation phases with highly statistically significant differences between pre/post ($P < 0.01$). This might be due to the achievements of the program, which may attributes to the fact that procedures were applied under the supervision and guidance of the researcher.

These results are in agreement with **Odhah et al. (2021)** their study results revealed that there was a highly significant difference between pre and post-scores in relation to nurses' practice after completion of the educational program. Also, the post scores proved by **Kaur and Charan (2018)** study titled " Study to assess the effectiveness of STP on knowledge and practice regarding ABGs among ICU nurses in selected Hospitals at Jalandhar" concluded that there was a significant difference between pre-test and post-test practice scores with improvement post educational program implementation for ICUs nurses.

The present result was in agreement with **Abed Elbaky et al. (2018)** whose study titled " Impact of the simulated education program on nurses' performance of invasive procedure at intensive care units: Evidence-based practice" who reported that after the educational program, the majority of the critical care nurses apply invasive procedures using EBP satisfactory at the post-program and follow up program phase. There were statistically significant improvements in the critical care nurses' mean score in all dimensions related to the general performance post-program and follow-up program.

This is in agreement with **Hassan et al. (2018)** their study results revealed that the educational program improves nurses' practice regarding caring for adult patients with an endotracheal tube and there was a statistically significant difference in the total nurses' practice during all program phases. These results had proven by **Geravandi et al. (2018)** whose study titled " The effect of education on the nursing care, quality of patients who are under mechanical ventilation in ICU ward" concluded that significant differences were observed in communication with patients, correct suctioning, compliance of aseptic techniques, the correct discharge of tube cuff, chest physiotherapy, the correct change positions, health food, backrub, prevent of foot drop, oral hygiene, and the eyes hygiene and protect the cornea had significant differences.

Regarding Mean scores among the studied nurses' total level of knowledge and practice throughout pre/post phases clarified that, there were improvements of the studied nurses' satisfactory level of knowledge and competence level of practice at pre/post phases with highly statistically significant differences between pre/post at ($P < 0.01$). This could be explained by nurses' interest and their needs to acquire knowledge and practices about this subject and the nurse's

awareness of the importance of gaining knowledge in this field in order to accomplish their duties properly.

The present study results supported by **Tadros et al. (2019)**, the finding of their study revealed that, there were highly statistically significant differences between total scores of nurses' level of knowledge and practice regarding caring for patients on MV pre/post-implementation of SLP. The current results were supported by **Mohammed and Farag (2019)** their study titled "Effect of self-instructional module on knowledge and practice of nursing students regarding tube feeding insertion" noticed that the developed self-instructional module showed effectiveness in improving nursing students' knowledge and practice. There was a significant difference between the mean post-test knowledge and practice scores of students after implementing it.

This present study proved by **Bayomi et al. (2018)** study titled "Effect of the nursing intervention program on nurses' knowledge, practices and patients' outcomes with bronchial asthma" concluded, implementing a nursing intervention program for the care of the patient with acute severe asthma is effective in inducing improvement in nurses' related knowledge and practice. The present study supported by **Mohammed (2016)** whose study titled "Nursing guidelines and its effects on nurses' knowledge and patient safety regarding nosocomial infection control measures in the Burn unit" mentioned there is a statistically significant difference between studied subjects pre and post-implementation of nursing guidelines.

This agrees with **Obaidan et al. (2018)** study titled "Evaluation of a training method to improve knowledge and confidence of prone positioning" mentioned that following the educational intervention, clinician knowledge of prone positioning increased, and confidence associated with performing the procedure

improved significantly. The findings of the current study were in the same line with **Xiong et al. (2016)** whose studied about "The effects of a mixed media education intervention program on increasing knowledge, attitude, and compliance with standard precautions among nursing students" documented that, after the mixed media education intervention, nursing students in the intervention group reported greater knowledge of standards precautions than did those in the control group. In accordance with these results, **Mohamed (2018)** who concluded the implementation of the nursing intervention protocol showed significant improvements in the ICU nurses' level of knowledge and practice

Regarding the correlation between total level of nurses' knowledge and practice throughout pre/post phases, the results of the present study revealed that there was a statically insignificant difference only between the total level of studied nurses' knowledge and practice for pre-test ($P > 0.05$). While there were highly statistically significant differences between the total level of studied nurses' knowledge and practice for pre-test and post-test phases ($p < 0.01$). This reflects the importance of integration between theory and practice.

These results were in agreement with **Odhah et al. (2021)** their study results revealed that the correlation between the nurse's knowledge and practice scores in the pre-implementation program; there is a positive correlation with a statistically significant difference. Also, **Rahmani et al. (2016)**, their study around "Effectiveness of scenario-based education on the performance of the nurses in the critical care unit for patients with acute respiratory distress syndrome". Who supported our results that reported the critical care nurses in both groups control and intervention used to deliver equal levels of care to those suffering from

acute respiratory distress syndrome before the scenario-based training with no significant difference was observed between the average scores of performance. In addition, there is a moderate positive correlation related to post immediately with a statistically significant difference between them. This in the same line with **Abed El-Aziz, (2014)** whose study titled "Effect of educational program on nurses' knowledge and skills about oral care for traumatized patients" shows that there was a significant positive correlation between the score of knowledge and score of skills $r=0.956$ post-education implementation for critical care nurses

Conclusion

Based on the finding of the current study, it can be concluded that implementing self-instructional module regarding acute respiratory distress during Covid-19 outbreaks is highly effective in inducing perfection of nurses' knowledge level and improvement of their practice level. There are statistically highly significant differences between studied nurses' satisfactory level of knowledge and competent level of practice at pre/post phases. As well, there were highly statistically significant correlations between the total level of studied nurses' knowledge and practice at pre-test and post-test phases.

Recommendations

From the foregoing conclusion, the following recommendation is suggested:

- Develop a periodical evaluation system to determine nurses' needs for updating their knowledge and improving their practice.
- Encourage training courses about acute respiratory distress syndrome care that should be mandatory for newly employed nurses.

- Designing an educational handout about acute respiratory distress syndrome care must be provided to nurses to be used as a reference guide in their practice.
- A further study to be carried out in different settings on a larger sample for a wider utilization of the self-instructional module, in order to achieve generalization of the results.

Reference

- Abd El-Aziz, M. (2014):** Effect of educational program on nurses, knowledge and skills about oral care for traumatized patients; AAMJ; 12; (1).
- AbdElbaky, M., Mohamed, E., and Nagib, R. (2018):** Impact of Simulated Education program on Nurses' Performance of Invasive Procedure at Intensive Care Units: Evidence Based Practice; International journal of Nursing Didactics, 8(12), 13-20.
- Abdollahi, M., Ghahramanian, A., Shahbazi S, Rezaei F, Naghili B, and Asghari-Jafarabadi M., (2020):** Developing a questionnaire to assess Iranian nurses' knowledge of and attitude to Middle East respiratory syndrome. East Mediterr Health J. May 21; 26(5):506-516. doi: 10.26719/emhj.19.065. PMID: 32538443.
- Abdou, F., and Dogham, R. (2016):** Impact of Using Simulation on Critical Care Nursing Students' Knowledge and Skills of Acute Respiratory Distress Syndrome; IOSR Journal of Nursing and Health Science; 5; 28-425
- Abdullah, M., Mohammed, W., and Ismail, M. (2014):** Nurses' knowledge and practices about administration of medications via nasogastric tube among critically ill patients. Journal of Education and Practice; 5(1); 147-159.
- Alsolami, F. (2021):** Working experiences of nurses during the novel coronavirus outbreak: A qualitative study explaining challenges of clinical nursing practice; Faculty of Nursing, Umm Al-Qura University, Makkah, Saudi Arabia; 2 June; Nursing Open; 2021; 00:1–10. Available at wileyonlinelibrary.com/journal/nop2 DOI: 10.1002/

- Bayomi, R., Taha, N., Zetton, H., and Elshora, A. (2018):** Effect of Nursing Intervention Program on Nurses Knowledge, Practices and Patients Outcomes with Bronchial Asthma. *Journal of Nursing Care*; 07(02), 1–6. <https://doi.org/10.4172/2167-1168.1000448>
- Cai, H., Tu, B., Ma, J., Chen, L., Fu, L., Jiang, Y., and Zhuang, Q. (2020):** Psychological impacts and coping strategies of front-line medical staff during COVID-19 outbreak in Hunan, China. *Medical Science Monitor*; 26; 1-17. [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7177038/CrossrefWeb of Science@Google Scholar](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7177038/CrossrefWeb%20of%20Science%40Google%20Scholar)
- Cascella, M., Rajnik, M., and Aleem, A. (2021):** Features, Evaluation, and Treatment of Coronavirus (COVID-19) [Updated 2021 Sep 2]. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554776/>
- Chau, J.P.C., Lo, S.H.S., and Saran, R. (2021):** Nurses' experiences of caring for people with COVID-19 in Hong Kong: a qualitative enquiry *BMJ Open*; 11:e052683. doi: 10.1136/bmjopen-052683
- Cishahayo, E.U et al. (2017):** Burnout among nurses working in critical care settings: a case of a selected tertiary hospital in Rwanda *International Journal of Research in Medical Sciences*; Dec; 5(12):5121-5128 DOI: <http://dx.doi.org/10.18203/2320-6012.ijrms20175430>
- Coronaviridae Study Group of the International Committee on Taxonomy of Viruses (2020):** The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2; *Nat Microbiol*; Apr;5(4):536-544. doi: 10.1038/s41564-020-0695-z. Epub Mar 2. PMID: 32123347; PMCID: PMC7095448.
- Crossman, A. (2020):** Understanding Purposive Sampling; An Overview of the Method and Its Applications; *Science, Tech, Math; Social Sciences*; Updated March 19, available at <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiI0Nmo6JL0AhXwEWMBHcm0BgsQFnoECAMQAw&url=https%3A%2F%2Fwww.thoughtco.com%2Fpurposive-sampling-3026727&usg=AOvVaw2DLZpk4TKCHmPhEMLEldoj>
- Dayalal, P., Kaushal P. and Arazu, P. (2021):** A Study to assess the effectiveness of Self-Instructional module on Knowledge about practice regarding management of patient with chest tube drainage among Nurses working in selected hospitals of North Gujarat; *Int. J. Nur.; Edu. and Research*; 9(1):67-68. doi: 10.5958/2454-2660.2021.00016.8 Available on: <https://ijneronline.com/AbstractView.aspx?PID=2021-9-1-16>
- Deep, R., Chaudhary, K. and Chacko, H.M. (2021):** [Effectiveness of Self Instructional Module \(SIM\) on Knowledge and Attitude regarding Care of Attempted Suicide Patients among Staff Nurses – A Pre Experimental Study](https://doi.org/10.5958/2454-2660.2021.00016.8), *Indian Journal of Forensic Medicine & Toxicology*; Vol. 15 No. 2.
- Diamond, M., Peniston, H.L., and Sanghavi, D. (2021):** Acute Respiratory Distress Syndrome (Nursing) [Updated 2021 Jul 25]. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK568726/>
- Doghish, A.S., Elkhatib, W.F., Hassan, E.A., Elkhateeb, A.F., Mahmoud, E.E., Ahmed, M.I., and Khalil, M.A.F. (2021):** Clinical characteristics of Egyptian male patients with COVID-19 acute respiratory distress syndrome. *PLoS One*. 16;16(4):e0249346. doi: 10.1371/journal.pone.0249346. PMID: 33861750; PMCID: PMC8051763.
- Geravandi, S., Soltani, F., Mohammadi, M., J., Alizadeh, R., Valipour, A., Hoseini, A., and Ghomeishi, A., (2018):** The effect of education on the nursing care quality of patients who are under mechanical ventilation in ICU ward. *Data in brief*; 16; 822-827.
- Giovanni, S.P., Jennerich, A.L., and Steel, T.L. (2021):** Promoting Evidence-Based Practice in Acute Respiratory Distress Syndrome: A Systematic Review. *Crit Care Explor*; 3(4):e0391. doi:10.1097/CCE.0000000000000391
- Girgis, S.A., Hafez, H.M., Elarab, H.E., Sherif, B., Sabry, M.H., and Afifi, I. (2021):** SARS-CoV-2 PCR positivity rate and seroprevalence of related antibodies among a sample of patients in Cairo: Pre-wave 2 results of a screening program in a university hospital. *PLoS ONE* 16(7): e0254581. <https://doi.org/10.1371/journal.pone.0254581>

- Grasselli, G., Zangrillo, A., Zanella, A., et al., (2020):** Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. *JAMA*; 323(16): 1574–1581. doi:10.1001/jama.2020.5394.
- Gopalan M., Rosinger K. and Ahn J., (2021):** Use of Quasi-Experimental Research Designs in Education Research: Growth, Promise, and Challenges; Volume: 44 issue: 1, page(s): 218-243 <https://doi.org/10.3102/0091732X20903302>
- Gorbalenya, A.E., Baker, S.C., and Baric, R.S. (2020):** Severe acute respiratory syndrome-related coronavirus: The species and its viruses – a statement of the Coronavirus Study Group; bioRxiv.02.07.937862; doi: <https://doi.org/10.1101/2020.02.07.937862>
- Guan, W.J., Ni, Z.Y., and Hu, Y. (2020):** China Medical Treatment Expert Group for Covid-19; Clinical characteristics of coronavirus disease 2019 in China; *N. Engl. J. Med.*; February 28. doi:10.1056/NEJMoa2002032PubMedGoogle Scholar
- Hassan, A. (2018):** Effect of Educational Program on Nurses' practices Regarding Care of Adult Patients with Endotracheal Tube. *Port Said Scientific Journal of Nursing*, 5(2), 142- 169
- Huang, C., Wang, Y., and Li, X. (2020):** Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.*; 395(10223):497-506. doi:10.1016/S0140-6736(20)30183-5PubMedGoogle ScholarCrossref.
- Jackson, D., Bradbury-Jones, C., and Baptiste, D. (2020):** Life in the pandemic: some reflections on nursing in the context of COVID-19. *J. Clin. Nurs.* ; 29: 2041–3. doi:10.1111/jocn.15257pmid:http://www.Ncbi.nlm.nih.gov/pubmed/32281185 CrossRefPubMedGoogle Scholar
- Kaur, A., and Charan, G. (2018):** Study to Assess the Effectiveness of STP on Knowledge and Practice Regarding ABGs among ICU Nurses in Selected Hospitals at Jalandhar, Punjab. 8(3), 182-186.
- Kroning, M. (2014):** The importance of integrating active learning in education; *Nurse Education in Practice*; Elsevier Company; Pp.14 -447-448. Retrieved from: [www.nurseeducationinpractice.com/article/S14715953\(14\)00081-X/pdf](http://www.nurseeducationinpractice.com/article/S14715953(14)00081-X/pdf). Accessed on 18/8/2019 at 9 PM.
- Lakshmikanthcharan, S., Sivakumar, M.N., and Hisham, M. (2019):** Stress and Burnout among Intensive Care Unit Healthcare Professionals in an Indian Tertiary Care Hospital. *Indian J. Crit. Care Med*; 23(10):4 62–466. doi: 10.5005/jp-journals-10071-23265
- Li, H. Chen, L. and Li, N. (2012):** Development and evaluation of an appraisal form to assess clinical effectiveness of adult invasive mechanical ventilation systems; [Scandinavian Journal of Trauma Resuscitation and Emergency Medicine](https://doi.org/10.1186/1757-7241-20-45); July; 20(1):45; DOI:[10.1186/1757-7241-20-45](https://doi.org/10.1186/1757-7241-20-45)
- Marini, J.J., and Gattinoni, L. (2020):** Management of COVID-19 respiratory distress; *JAMA*. <https://doi.org/10.1001/jama.2020.6825>.
- Mohammad, E. (2018):** Intensive Care Unit Nurses' Performance Regarding Caring Patients With Head Injury: An Educational Intervention; *International Journal of Studies in Nursing*, 3(3), 141.
- Mohammed, H., and Farag, A. (2019):** Effect of Self-Instructional Module on Knowledge and Practice of Nursing Students Regarding Tube Feeding Insertion. *Journal of Health, Medicine and Nursing*, 4(1), 1-14.
- Mohammed, I. (2018):** The Impact of Training in Improving Nurses Performance in Mechanically Ventilated Patients in Khartoum and Alshaab Teaching Hospitals (2010- 2014) (Doctoral dissertation, University of Gezira).15-25.
- Mohammed, S. (2016):** Nursing Guidelines and Its Effects on Nurses' Knowledge and Patient Safety Regarding Nosocomial Infection Control Measures in Burn Unit. *IOSR Journal of Nursing and Health Science*, 5(05), 06-16.
- Middleton, F. (2021):** Reliability vs validity: what's the difference?; Published on July 3, 2019 by Revised on July 16, 2021. Available at <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwity9jW9ZL0AhWB2eAKHUCAXEQFnoECAsQAaw&url=https%3A%2F%2Fwww.scribbr.com%2Fmethodology%2Ftypes-of->

validity%2F&usg=AOvVaw1kPtFSAFudPJt0TsuU
OTT_

- Navas-Blanco, J.R., and Dudaryk, R. (2020):** Management of Respiratory Distress Syndrome due to COVID-19 infection. *BMC Anesthesiol* 20, 177 (2020). <https://doi.org/10.1186/s12871-020-01095-7>
- Obaidan, A., Scott, J., Mirza, S., Aljoaid, A., Tailor, R., and David L. (2018):** Evaluation of a Training Method to Improve Knowledge and Confidence of Prone Positioning. *Respiratory Care Education Annual*, 27, 3–15. Retrieved from www.aarc.org
- Odhah M., Ahmed F., Mohammed M., AbdEl-Aziz M., and Mahgoub A. (2020):** Effect of an Educational Program about Acute Respiratory Distress Syndrome on Critical Care Nurses' Performance, Assiut. *Scientific Nursing Journal*; Vol (8); No (20); March, pp (1- 12)
- Odhah, M., Al-Qubati, F., Mohammed, M., AbdEl-Aziz, M., and Mahgoub, A. (2021):** Impact of Video Assisted Teaching Intervention on Critical Care Nurses Knowledge Regarding Extracorporeal Membrane Oxygenation *International Journal of Novel Research in Healthcare and Nursing*, Vol. 8, Issue 2, pp: (384-395), Month: May - August, Available at: www.noveltyjournals.com
- Oshi, P., Thomas, M., Lakshmanan, G., Garg, R., Lalwani, S., and Vij, A. (2020):** Pilot testing of a computer based self-instructional module on organ donation for improvement in knowledge and acceptability of nurses working in the intensive care unit of a tertiary care institute; *Indian J. Physiol Pharmacol*; 64(Suppl_1): S76-S81.
- Park, S.E. (2020):** Epidemiology, virology, and clinical features of severe acute respiratory syndrome - coronavirus-2 (SARS-CoV-2; Coronavirus Disease-19). *Clin. Exp. Pediatr.*; Apr; 63(4):119-124. doi: 10.3345/cep. 00493. Epub 2020 Apr 2. PMID: 32252141; PMCID: PMC7170784.
- Park, M., Thwaites, R.S. and Peter, J.M. (2020):** COVID-19: Lessons from SARS and MERS; [European Journal of Immunology](http://www.eurimm.org); February 27; [Volume 50, Issue 3](http://www.eurimm.org) p. 308-311 available at <https://doi.org/10.1002/eji.202070035>

- Peeri, N. C., Shrestha, N., Rahman, M. S., Zaki, R., Tan, Z., Bibi, S., Baghbazadeh, M., Aghamohammadi, N., Zhang, W., and Haque, U. (2020):** The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: What lessons have we learned? *International Journal of Epidemiology*; 49(3), 717-726, <https://doi.org/10.1093/ije/dyaa033> [CrossrefPubMedWeb of Science@Google Scholar](https://pubmed.ncbi.nlm.nih.gov/33081212/)
- Radwan GN. (2020):** Epidemiology of SARS-CoV-2 in Egypt. *East Mediterr Health J.*; 26(7): 768–773 <https://doi.org/10.26719/emhj.20.084>
- Rahmani, A., Mohammadi, A., and Moradi, Y. (2016):** Effectiveness of scenario-based education on the performance of the nurses in the critical care unit for patients with acute respiratory distress syndrome; *International Journal of Medical Research & Health Sciences*, 5(8), 218-224.
- Rathnayake, S., Dasanayake, D., Maithreepala, S.D., Ekanayake, R., and Basnayake, P.L. (2021):** Nurses' perspectives of taking care of patients with Coronavirus disease 2019: A phenomenological study. *PLoS ONE* 16(9): e0257064. <https://doi.org/10.1371/journal.pone.0257064>
- Roberts, N.J., Kelly, C.A., and Lippiett, K.A. (2021):** Experiences of nurses caring for respiratory patients during the first wave of the COVID-19 pandemic: an online survey study *BMJ Open Respiratory Research*; 8: e000987. doi: 10.1136/bmjresp-2021-000987
- Sedhai, Y.R., Yuan, M., Ketcham, S.W., Co, I., Claar, D.D., McSparron, J.I., Prescott, H.C., and Sjoding, M.W. (2020):** Validating Measures of Disease Severity in Acute Respiratory Distress Syndrome. *Ann Am Thorac Soc.*;18(7):1211-1218. [PMC free article] [PubMed]
- Shang, Y., Pan, C., Yang, X. et al., (2020):** Management of critically ill patients with COVID-19 in ICU: statement from front-line intensive care experts in

Wuhan, China. *Ann. Intensive Care*; 10, 73.
<https://doi.org/10.1186/s13613-020-00689-1>

Tadros, S., Abed EL Sattar, M., Shehata, H., and Nadr, M. (2019): Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators *Egyptian Journal of Health Care; EJHC*; Vol.10 No.3.

Thanakijtummakul, N. (2021): Nursing Care for Covid-19 Patients with Acute Respiratory Distress Syndrome. *TJNC* [Internet]. 2021 Jun.30 [cited 2021 Oct.16];36(03):16-0. Available from: <https://he02.tci-thaijo.org/index.php/TJONC/article/view/249437>

Trust UHBNF (2020): Aerosol generating procedures. Available at <https://www.uhb.nhs.uk/coronavirus-staff/aerosol-generating-procedures.htm> [Accessed 26 Aug 2020].

World Health Organization (2021): The current COVID-19 situation at Egypt; Latest update: 22 October, 05:45 pm EET. Available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi2odb60eHzAhUONowKHX_sADEQFnoECAsQAQ&url=https%3A%2F%2Ftradingeconomics.com%2Fegypt%2Fcoronavirus-cases&usg=AOvVaw1d2Ofk6r2Yfktj6q1DzKa-

World Health Organization (2020): Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases; Interim guidance; March 2; V; 3^v. Available at <https://apps.who.int/iris/bitstream/handle/10665/331329/WHO-COVID-19-laboratory-2020.4-eng.pdf>.

Xiong, P., Zhang, J., Wang, X., Wu, T., and Hall, B. (2017): Effects of a mixed media education intervention program on increasing knowledge, attitude, and compliance with standard precautions among nursing students: A randomized controlled trial; *American journal of infection control*; 45(4); 389-395.

Xu, Z., Shi, L., Wang, Y., Zhang, J., Huang, L., Zhang, C., et al. (2020): Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir Med.*; 8(4):420–2. [https://doi.org/10.1016/S2213-2600\(20\)30076-X](https://doi.org/10.1016/S2213-2600(20)30076-X). [Article PubMed PubMed Central CAS Google Scholar](#)

Zainib, T., Afzal, M., Sarwar, H., and Waqas, A. (2017): The Gap between Knowledge and Practices in Standard Endotracheal Suctioning of Intensive Care Unit Nurses in Lahore Hospital's; Lahore School of Nursing (LSN); Faculty of Allied Health Sciences, the University of Lahore; *Saudi J. Med. Pharm. Sci.*; 3 (6): 454-463 Available at: <http://scholar.smepub.com/sjmps/8-9-2017> at 10.0