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# International Journal of Nursing Education

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# An Electronic-based Simulator for Intramuscular Injection in Newborns

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## ABSTRACT

**Background:** Injection is an essential skill for nurses. In nurse education, simulators assist learning of nursing students. There are various types of simulators for practicing intramuscular injections in neonates. However, cost, time, and ability to provide formative feedback to learners remain issues in many simulators for nursing education. Intramuscular injection in a newborn is significantly different from other ages and simulator for this purpose is lacking.

**Methods:** This pilot study aims to present the design and development of an electronic simulator as an instructional tool for a nursing student to practicing newborns' intramuscular injection and to examine its effectiveness.

**Results:** An electronic-based simulator for a newborn's intramuscular injection was designed and developed. The simulator contains three parts: 1) a manikin with an injection area that is made of soft silicone; 2) a box of an electrical circuit, and 3) an injection kit. By using a semi-structured interview technique, we show that the developed simulator is helpful for learning injection skill due to feedback of formative assessment.

**Conclusion:** The proposed electronic-based simulator is a prototype of an instructional tool for a nursing student to practicing newborns' intramuscular injection. However, based on the user comments and suggestions, the weight of the proposed simulator, its safety, and its pattern in giving feedback are needed to be improved in future studies.

**Keywords:** Injection, Newborn, Nursing Education, Simulator

## INTRODUCTION

Drug administration is the process to provide humans with some drug, which is any substance that affects the human's structure or function<sup>(1)</sup>. Injection delivers a given drug into the human body by using a syringe and a needle<sup>(2)</sup>. Four types of injections depend on the target site of the human skin layer include intradermal injection, subcutaneous injection, intramuscular injection, and intravenous injection<sup>(3)</sup>. To deliver a vaccine, a biological

agent, helps prevent the disease<sup>(2)</sup>. It can be given by gastrointestinal routes such as the Polio vaccine, or injection routes such as the Hepatitis B vaccine, etc. For the newborn or the baby whose age is after birth to twenty-eight days, most vaccines are administered via the "intramuscular injection route"<sup>(4)</sup>.

The intramuscular injection delivers drug into the muscle layer using a syringe and a needle<sup>(5)</sup>. Many drugs intramuscularly injected into the newborn group are Vitamin K

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and Hepatitis B vaccine<sup>(6)</sup>. Both are important recommended drugs for all newborns due to prevent the body's bleeding and Hepatitis disease, respectively<sup>(7-9)</sup>. The technique of intramuscular injection can be administered at four different sites: the deltoid muscle located at the shoulder site, the ventrolateral muscle located at the hip site, the gluteal muscle at the buttock, and the vast lateral muscle located at the thigh<sup>(10-12)</sup>. For the children under one year, an appropriate intramuscular injection's landmark is the vastus lateralis muscle which is located at the anterior of the thigh. This muscle is preferred for injection because of its easy-to-assess position, large size, less painful, well developed, and located far from major blood vessels and nerves<sup>(10, 13)</sup>.

The safety injection is performed based on the Rights principle of injection: the right drug, right dose, right time, right patient, right route, right form, right preparation, right reason, right documentation, and right response<sup>(14-16)</sup>. Providing the safety injection to newborns is an essential psychomotor skill of a nurse. On the other hand, the inappropriate injections, for example incorrect site of injection or incorrect depth of injection can lead to nerve injury<sup>(17)</sup>, or partial rupture of the muscle<sup>(18)</sup>. For these reasons, completing the safety injection skill thus is a requirement for all nursing students to graduate. Generally, nursing students would be assigned to completed their classroom learning, and then demonstrate their injection skills by using a sponge simulator.

The proposed simulator for learning of a newborn's intramuscular injection consists of (i) a doll resembling a newborn, (ii) a sponge resembling the injection landmark, and (iii) equipment for injection. We conducted surveys on our nursing students and the registered nurses, and found that the sponge is unable to indicate a correct depth and a correct site of the injection. Accordingly, they cannot measure their injection ability, especially the ability of the injection site and injection depth which is an essential key of injection for reaching a target site<sup>(19)</sup>.

Many learning simulators for injection have been developed, for examples (1) an intramuscular injection model which is made of low-cost Chamois sponge to prevent fungal growth<sup>(20)</sup>, (2) a deltoid muscle intramuscular injection model made of underwear<sup>(21)</sup>, (3) an intramuscular injection simulation made of silicone<sup>(22)</sup>, (4) a smartphone inverter application to demonstrate intramuscular injection made of silicone and microcontroller<sup>(23)</sup>, (5) an intramuscular injection model made of hard silicone<sup>(24)</sup>, (6) an intramuscular injection and blood collection model made of natural rubber<sup>(25)</sup>, (7) a low-fidelity model for needle decompression procedure made of Jell-O<sup>(26)</sup>, (8) a low-cost transcervical laryngeal injection made of toilet paper tube<sup>(27)</sup>, and (9) a simulation model for transcervical laryngeal injection made of silicone and electromyographic<sup>(28)</sup>. There are many advantages of these previous instructional materials. They can provide real-time feedback to improve students' injection skill using sound feedback<sup>(28)</sup>, which are inexpensive, and reusable<sup>(20-22, 24-26)</sup>, and realistic<sup>(22, 25)</sup>.

However, we have found that still, no simulator could measure the correct position and the correct depth of the intramuscular injection in newborns, and provide informative feedback to the learners. Therefore, we propose here an electronic-based simulator of newborn's intramuscular injection for nursing students that could show accuracy of nursing students' injection in terms of the correct site and correct depth of injection, and could provide feedbacks to the students.

## MATERIALS AND METHODS

To develop the simulator are consists of three main parts are as follows;

### Development of the manikin with an injection area

A hard silicone doll represented a newborn. The hard silicone doll is an easily available material in the market and inexpensive. The criteria we used to select the doll for being the manikin are size and shape of its legs.



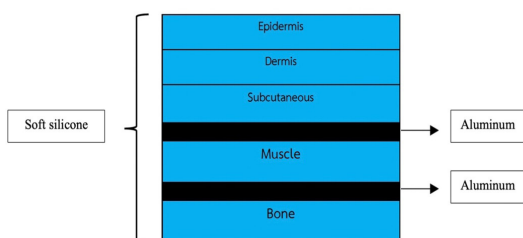
The normal skin structure of a newborn baby consists of four layers, from top to bottom: the epidermis, the dermis, the subcutaneous, and the muscle, respectively. In this research, all layers of skin to bone are mimicked by soft silicone. The conductive aluminum foil sheet is a material that detects the injection's site and injection depth. The first layer of the aluminum foil is inserted between the subcutaneous skin layer and the muscle layer. The second layer of the aluminum foil is inserted between the muscle layer and the bone layer. The component of the skin layer is shown in figure 1.

We developed the vocalization of the electronic-based simulator. Firstly, the three layers of skin were created. Secondly, the area of injection at the position in front of the doll's leg was created by the hard silicone cutting off, and then replaced by a soft silicone for mimicking the three skin layers. The two types of solenoid valves were placed adjacent to the mimicked subcutaneous layer and acts as a key to control the correct position and depth of injection.

Next, the muscle layer was created. The soft silicon was used to mimic the tissue layer for the correct size and at the position of depth for injection. Next, a conductor made of aluminum sheet was inserted between the subcutaneous layer and the muscle layer, and that between the muscle layer and the bone. A small hole was made for connecting the wires between the electrical circuit and the two aluminum sheets. Finally, an electronic circuit board was created and connected to the wires that are linked to the injection's area.

### Development of an electrical circuit

The knowledge of electronics is applied to generate sound feedback to students and



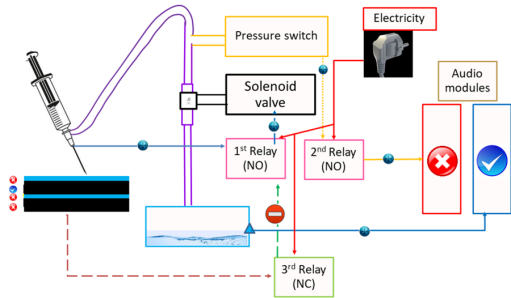
Fig/ 1: The component of skin layers simulated by soft silicone and aluminum sheet.

is inexpensive and available during the COVID-19 outbreak. The electronic circuit consists of three major systems: (1) an injection system simulated by an electrical system; (2) an evaluation injection system simulated by checking the electrical energy, and (3) a response system in which the audio source responds to provide verbal instructions to the student

*The first system*, it uses the flow of electricity to represent the flow of medicine injected by the needle. When injected, the electric current travels from the syringe to the skin layers according to the depth of the needle injected. For example, when the student injects to the target depth at a position  $\frac{5}{8}$  to 1 inch for a newborn, the electrical system will be connected and becomes a closed circuit at the position <sup>(29)</sup>.

*The second system*, it assesses the electrical current that has passed through the different layers of the skin. The current is passed to the relay (NO I) and to the solenoid valve, which is responsible for converting the electrical energy from the power generating source into kinetic energy <sup>(30)</sup>. Consequently, an audio device is activated to provide real-time feedback to the learner regarding the location and depth of the injection. The liquid in the syringe will be drained into the storage tank that is in the box until its level reaches the defined level. Lastly, *a response system* includes liquid in the storage tank that stimulates the audio module to provide a sound of *very good*.

Nonetheless, there would no electricity in the electrical circuit if the student injects the needle at the incorrect injection site or depth. The third normally closed type of relay (NC) will be open and then inhibit the current from the first normally opened relay (NO I). The pressure of the plunger's force then stimulates the pressure switch and the second normally opened type of relay (NO II), respectively. Consequently, the liquid in the syringe will not be drained into the storage tank, and the audio module will generate the sound of *checking it again*. The mechanism of providing audio feedback is shown in figure 2.



**Fig. 2: The mechanism providing feedback to learners**

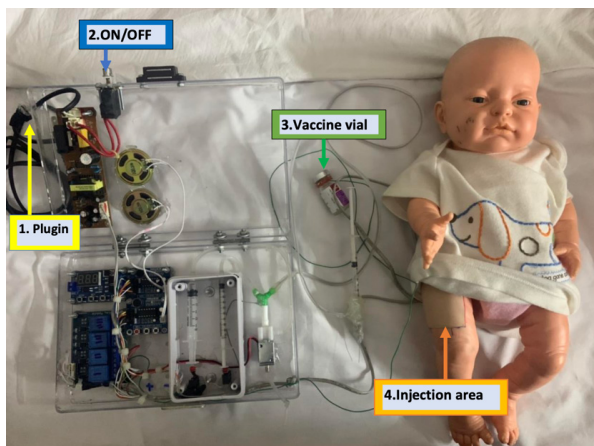
**RESULT**

The finished simulator comprises of a newborn manikin (1) with the injection area (2) connected to a box of the electronic circuit (3). The power resource 220 voltages (4) is used in this simulator and connects to the box of the electronic circuit. The final simulator is shown in figure 3.

The audio feedback is specific in terms of the correct injection site and depth. The learners will be received audio feedback of “very good” when their injection’s ability of site and depth is correct. On the other hand, the audio feedback will be appeared to “check it again” when their injection’s ability is incorrect in either site or depth. The audio feedback is shown in table 1.

**Prototype testing**

Due to the pandemic of Covid-19, it was tested with only one registered nurse who had



**Fig. 3: The electrical-based simulator of a newborn’s intramuscular injection**

**Table 1: The audio feedbacks of electrical-based simulator**

Injection site	Injection depth	Audio feedback
Correct	Correct	Very good
Correct	Incorrect	Check it again
Incorrect	Correct	Check it again
Incorrect	Incorrect	Check it again

eight years of pediatrics’ injection experience. She evaluates that it is useful in evaluating the ability of injecting the correct position and depth, and providing audio feedback to help the learners improve their learning. Additionally, it is reusable and inexpensive when compared to commercial devices.

However, it still has the limitation that the weight of the electrical box is too heavy to carry. The syringe’s weight is also too heavy which would affect the psychomotor skill. The battery should be used instead of the main electricity for safety. Moreover, it would be more useful if the feedback could be specific in terms of correcting depth to help learners understand more about their skill of injection depth.

**CONCLUSION**

The proposed electronic-based simulator can be used as a learning material for newborn’s intramuscular injection in nursing education. It is specifically designed for injecting in a newborn which differs from other ages, and provides formative assessment to learners for improving their skills. Finally, future studies are needed to further optimize and address current limitations.

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**Ethical Clearance-** This research has been declared ethical by the Mahidol University Central Institutional Review Board with the number MU-CIRB 2021/450.1910



**Conflict of Interest-** None declared

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# A Study to Assess the Effectiveness of Structured Teaching Programme (STP) on Knowledge Regarding Polycystic Ovarian Disease (PCOD) Among Adolescent Girls of Selected Schools, Faridkot, Punjab

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## ABSTRACT

This study was conducted to assess the effectiveness of structured teaching programme (STP) on knowledge regarding polycystic ovarian disease (PCOD) among adolescent girls of selected schools, Faridkot, Punjab. A quantitative research approach and quasi-experimental research design was used for the study. The sample size was 60 adolescent girls, 30 in experimental group and 30 in control group selected by non-probability purposive sampling technique. The data was collected by Self Structured knowledge questionnaire. Descriptive and inferential statistics were used to analyze the data. Discussion was based on objectives of the study, statistical analysis, current trends and previous related research. The study revealed that in control group and experimental group pre-test level of knowledge 20% adolescent girls had adequate knowledge, 80% had inadequate knowledge and 23.3% had adequate knowledge, 76.7% had inadequate knowledge respectively. There was no significant relationship between the level of knowledge of adolescent girls with their selected demographic variables both in experimental and control group. In control group pre-test and post-test mean  $\pm$  SD for knowledge of adolescent girls were  $10.07 \pm 2.815$  and  $9.37 \pm 2.906$  respectively. The difference between mean  $\pm$  SD of pre-test and post-test level of knowledge of control group was statistically non significant at  $p < 0.05$  level. In experimental group pre-test and post-test mean  $\pm$  SD for knowledge score of adolescent girls was  $10.33 \pm 2.591$  and  $20.00 \pm 4.807$  respectively. The difference between mean  $\pm$  SD of pre-test and post-test level of knowledge of experimental group was statistically significant. Hence, structured teaching programme was effective in improving the knowledge regarding Polycystic Ovarian Disease among adolescent girls of experimental group.

**Keywords:** Knowledge, Polycystic Ovarian Disease, Adolescent Girls. Structured Teaching Programme.

## INTRODUCTION

PCOD is the most prevalent cause of infertility in the United States, affecting 5 to 6 million women, according to the Hormone Foundation. PCOD has an effect on 35% of Indian teenagers. Women in their reproductive years account for at least 80% of all instances of persistent menstrual irregularity. It

accounts for 15% to 25% of infertility cases. A woman may have symptoms of PCOS without matching the diagnostic criteria, which often include irregular or nonexistent periods, evidence of increased androgens, or hormones of the male gender. The rise in childhood obesity has resulted in an earlier beginning of menstruation, which has led to the emergence of PCOD in younger girls. PCOD patients

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will have to deal with the long-term health repercussions for many more years.<sup>1</sup>

PCOD is a frequent health issue that affects many young women, especially girls. Women in their reproductive years are affected by it, and it is regarded to be one of the most common reasons of infertility<sup>2</sup>.

Although environmental and genetic variables have been linked to the development of PCOD, the exact aetiology of the condition remains a mystery. Currently, scientists are trying to figure out if the ovary, the hypothalamus-pituitary axis, or aberrant insulin activity is to blame for the illness. Adolescents as well as women of reproductive age and post-menopausal women might suffer from the illness. As a result, it is impossible to pinpoint a particular gene mutation as the cause. In fact, the condition often runs in families, indicating that it may be inherited.<sup>3</sup>

PCOD does not have a cure, although it may be treated and controlled in numerous ways. Many of the health problems connected with PCOD, such as high blood pressure and diabetes, may be reduced significantly if a woman loses weight. In some cases, weight reduction alone may bring hormone levels back to normal, reducing or eliminating many of the symptoms. Weight gain may be prevented by adopting healthy eating and activity habits. Assisting and learning from one's peers who are also dealing with PCOD is a rewarding experience. As a result, the presence of polycystic ovaries on ultrasound is a symptom of PCOD rather than proof of the illness.<sup>4</sup>

### NEED FOR THE STUDY

The health of a country's youth is crucial to its overall health. PCOD affects 35 percent of Indian teens. It's mostly because of the changes in lifestyle. The rise in PCOD diagnoses among Indian women is mostly due to the adoption of poor eating habits and a lack of physical activity. Older Indian women, on the other hand, consume more traditional, lower calorie, and sugar-free cuisine. Increasing numbers of

young Indian women are consuming a diet of fast food. Indians have increasingly relied on Western meals and lifestyles during the last two decades. Obesity prevalence is expected to rise by up to six fold in the next 10 years, notably in India, which currently has the highest diabetes prevalence rates in the world (WHO 2009). As a result, they are better able to identify and prevent PCOD's consequences, such as type 2 diabetes, high blood pressure, and cardiovascular disease.<sup>5</sup>

According to the majority of research, polycystic ovaries are present in 3-7 percent of women globally. It is believed that the prevalence in India is at least three times that in the West. Menstrual irregularities, infertility, hirsutism, acne, obesity, and the metabolic syndrome are just a few of the health issues that PCOD may cause. Ultrasonography-detected polycystic ovaries, unpredictable ovulation, and high levels or activity of male hormones are the primary signs of polycystic ovary syndrome (hyperandrogenism). Diabetes type 2 is also more prevalent in women with PCOD.<sup>6</sup>

### RESEARCH PROBLEM

A study to assess the effectiveness of structured teaching programme (STP) on knowledge regarding Polycystic Ovarian Disease among adolescent girls of selected schools, Faridkot, Punjab.

### OBJECTIVES

1. To assess the pre-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control and experimental group.
2. To prepare and administer structured teaching programme (STP) regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in experimental group.
3. To assess the post-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control and experimental group.

- To assess the effectiveness of structured teaching programme (STP) by comparing pre- test and post-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control and experimental group.
- To find out the significant association between post-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control and experimental group with their selected demographic variables.

## RESEARCH HYPOTHESIS

**H<sub>1</sub>:** There will be significant difference between the pre-test and post-test level of knowledge score among adolescent girls in experimental group.

## METHODOLOGY

- Research Approach:** A quantitative research approach was used.
- Research Design:** A quasi-experimental research design was used.
- Target Population:** Adolescent girls of age 15-18 years in +1 and +2 class in selected schools.
- Sample Size:** 60 adolescent girls, (30 for Experimental group and 30 for Control group.)
- Sampling Technique:** purposive sampling technique was used.
- Tool:** Socio demographic variables, Self-structured knowledge Questionnaires, Structured Teaching Programme.

### Inclusion criteria:

- Adolescent girls who were willing to participate in the study of selected schools of Faridkot, Punjab.
- Adolescent Girls in the age group of 15-18years.

### Exclusion Criteria

Adolescent girls were not available at the time of data collection.

## FINDINGS

Table 1 depicts that in experimental group 7(23.3%) adolescent girls had adequate knowledge and 23(76.7%) girls had inadequate knowledge. In control group 6 (20.0%) adolescent girls had adequate knowledge and 24(80%) had inadequate knowledge.

Hence, maximum adolescent girls were having in adequate knowledge about Polycystic Ovarian Disease (PCOD) in both control and experimental group.

Table 2 depicts that in experimental group 25 (83.3%) adolescent girls had adequate knowledge and 5(16.7%) had inadequate knowledge. In control group 8(26.7%) had adequate knowledge and 22(73.3%) had inadequate knowledge.

Hence, maximum adolescent girls having adequate knowledge about Polycystic Ovarian Disease (PCOD) in experimental.

Table 3 depicts that in experimental group pre-test the mean  $\pm$  SD for the knowledge score of adolescent girls was  $10.33 \pm 2.591$  and post-test for knowledge score of adolescent girls was  $20.00 \pm 4.807$ . The difference between pre-test and post-test knowledge score of experimental group was statistically significant at level of 0.05.

**Table 1: Pre-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control and experimental group.**

N=60

Level of Knowledge	Score	Experimental group		Control group	
		f	%	f	%
Adequate	13-25	07	23.3	06	20
Inadequate	0-12	23	76.7	24	80

**Table 2: Post-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control and experimental group.**

N=60

Level of Knowledge	Score	Experimental group		Control group	
		f	%	f	%
Adequate	13-25	25	83.3	06	26.7
Inadequate	0-12	05	16.7	22	73.30



**Table 3: Comparison the Pre-test and post-test level of knowledge regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in experimental group.**

N=30

Test	Mean	SD	MD	t-value	df	P-value
Pretest	10.33	2.591	+9.667	+ 9.811	29	.001*
Posttest	20.00	4.807				

\*Significant at the level of 0.05

**Table 4: Comparison the Pre-test and post-test level of knowledge score regarding Polycystic Ovarian Disease (PCOD) among adolescent girls in control group.**

N=30

Test	Mean	SD	MD	t-value	df	P-value
Pretest	10.07	2.815	+0.700	+1.019	29	316NS
Posttest	9.37	2.906				

\*Significant at the level of 0.05

Table 4 depicts that in control group pre-test the mean  $\pm$ SD for the knowledge of adolescent girls were  $10.7 \pm 2.815$  and post-test the mean  $\pm$  SD for knowledge of adolescent girls were  $9.37 \pm 2.906$ . The difference pre-test and post-test knowledge score of control group was statistically non significant at the level of 0.05.05.

## DISCUSSION

The finding of the study revealed that in Pre-test 6(20.0%) of the adolescent girls had adequate knowledge, 24(80.0) had inadequate knowledge in control group. In experimental group Pre-test knowledge score 7(23.3%) adolescent girls had adequate knowledge 23(76.7%) had inadequate knowledge score. The findings are supported by "Sheela W, Mrs. Lissa J, Saraswathi K (2017)<sup>7</sup> conducted study to assess the effectiveness of structured teaching programme on knowledge regarding polycystic ovarian syndrome among adolescent girls. In the present study, the pre test finding showed that most of adolescent girls 51 (85%) are having average knowledge, 5 (8.3%) are having poor knowledge and 4 (6.6%) are having good knowledge regarding PCOD. The post-test findings showed that majority of the adolescent girls 46 (76.6%) have average knowledge and 14 (23.3%) are having good knowledge regarding PCOD and none of them have poor knowledge.

The finding of study revealed the Post-test of 8 (26.7%) adolescent girls had adequate

knowledge, 22 (73.3%) had inadequate knowledge in control group. In experimental group 25(83.3%) of adolescent girls had adequate knowledge, 5(16.7%) had inadequate knowledge. The finding are supported by "John S (2021)<sup>8</sup> conducted a quasi-experimental study to assess the effectiveness of structured teaching programme on knowledge regarding polycystic ovarian disease among adolescent girls. The finding in present study revealed that a majority (90.0%) 54 had inadequate knowledge, 10.0% (6) had moderate knowledge and none of them had adequate knowledge STP. But a majority 80.0% (48) had a adequate knowledge, 20.0% (12) Had moderate knowledge and none of them had inadequate knowledge after STP. Structured teaching programme was significantly effective in increasing the knowledge of polycystic ovarian disease.

The finding of present the study revealed that in control group pre-test the mean  $\pm$  SD for the knowledge of adolescent girls were  $10.7 \pm 2.815$  and post-test the mean  $\pm$  SD for knowledge of adolescent girls were  $9.37 \pm 2.906$ . The difference pre-test and post-test knowledge score of control group was statistically non significant at 0.05 In experimental group the mean and standard deviation for knowledge of adolescent girls was  $9.37 \pm 2.906$  in pre-test and post-test respectively. The difference between the pre-test and post-test mean knowledge 0.700 was significant at 0.05. These findings are

supported by **Kalpna SP (2013)**<sup>9</sup> findings related to effectiveness of structured teaching programme on knowledge regarding polycystic ovaries among pre-university students depicts that, enhancement between the pre-test and post-test was 19.75 and obtained Paired 't' test value was 7.49, it was highly significant at level  $<0.05$ . Thus the structured teaching programme was effective in improving regarding polycystic ovarian disease.

The finding of present study revealed that for knowledge of adolescent girls according to age, educational status, religion, residence, dietary pattern, previous knowledge regarding PCOD, any family member suffer from PCOD, Source of information calculated at  $p < 0.05$ . It was concluded by chi-square test that there was no significant relationship between the knowledge of adolescent girls with their demographic variables at  $p < 0.05$  level. "**Swapnil G & Mohini S (2019)**<sup>10s</sup> conducted a quasi-experimental study to assess the effectiveness of structured teaching programme (STP) on knowledge regarding polycystic ovarian disease. There is no significant association between knowledge and course, knowledge and gender, knowledge and marital status such as  $p$  value was ( $p > 0.05$ ). Structured teaching programme is very effective in improving knowledge.

## CONCLUSION

Adolescent girls in the control and experimental groups were tested with the pretest and posttest knowledge of polycystic ovarian disease (PCOD). Researcher found that an adolescent understanding of Polycystic Ovarian Disease (PCOD) was high in the experimental group after a structured teaching programme. Adolescent girls' awareness of PCOD was not correlated with their demographic factors, such as age (in years), education, religious affiliation, and eating habit.

**Conflicts of Interest:** Nil

**Source of funding:** Self

**Ethical Clearance:** Written permission from ethical committee of college and thereafter

written permission from principal of selected schools were taken. After this, verbal informed consent was taken from every adolescent girls who was included in study.

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# Assessment of Nurse's Knowledge Regarding Endotracheal Tube Suctioning in Intensive Care Units, Najran Hospitals, Saudi Arabia

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## ABSTRACT

**Background:** Endotracheal suctioning (ETS) is a process in which the catheter inserted in to the endotracheal tube. This process prevents accumulation of the secretion, thereby maintains airway patency, and ensures optimal oxygenation and saving the patients' lives. Nurse's knowledge and compliance to proper suctioning techniques are very important for prevention of infections. Therefore, the aim of this study to assess nurse's knowledge about endotracheal tube suction.

**Methods:** A descriptive study was conducting in Najran hospital, study population was included all nurses that working in Najran hospital during the data collection period were invited to participate in the study. Self-administered questionnaire was used to collect the data.

**Results:** Most of the participants (75%) had knowledge about indication of endotracheal tube suction, and (62%) of them had knowledge toward complications and (57%) had knowledge regarding important measures to reduce risk of infection, the ideal duration of suctioning and more than half (56%) had total knowledge regarding endotracheal tube suction, and there is a significant association between the overall level of knowledge and training courses (p-value 0.032).

**Conclusions:** The study concludes more than half (57.9%) had moderate level knowledge, while (33.3%) had poor knowledge. Study emphasizes to providing a written update guideline for endotracheal tube suction in study setting to ensure enough nurses' knowledge.

**Keywords:** endotracheal tube, suction, knowledge, nurses, intensive care, Saudi Arabia.

## INTRODUCTION

Endotracheal Tube (ETT) is a type of tracheal tube that is inserted through the mouth (orotracheal) or nose (nasotracheal). Typically, an ETT is constructed of polyvinyl chloride<sup>1</sup>. A client with a tracheostomy or endotracheal tube is less able to increase intrathoracic pressure for an effective cough to clear secretions (Evelyn

Seip, 2016). The most commonly used artificial airway for respiratory support is endotracheal intubation<sup>2</sup>. Endotracheal suctioning, an essential component in the management of airway patency and secretion removal in the critically ill, has become a routine part of care for mechanically ventilated patients in the Intensive Care Unit<sup>3</sup>.

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Endotracheal suctioning (ETS) is a process in which the catheter inserted in to the endotracheal tube and the secretions of patient's lung removed with applying the negative pressure. This process prevents accumulation of the secretion, thereby maintains airway patency and ensures optimal oxygenation and saving the patients' lives<sup>4</sup>.

The primary purposes of ETS are to provide adequate oxygenation, maintain airway permeability and gaseous exchange, increase alveolar ventilation, and prevent ventilator-associated pneumonia<sup>5</sup>.

Because micro-aspiration of secretions is a risk factor for Ventilator Associated Pneumonia, assessment of practices related to oral suctioning, oral care, and management of endotracheal tube is important<sup>6</sup>.

ETS prevents accumulation of the excessive secretion into the lungs, thereby maintains airway patency, and ensures optimal oxygenation and saving the patients' lives<sup>7</sup>.

This intervention allows airways clearance, preserving their permeability and facilitating adequate gas exchange<sup>8</sup>.

Also, it was associated with consequences and risks such as hemorrhage, lesions of the tracheal mucosa, infections, atelectasis, cardiovascular disorder, hypoxemia, and increase intracranial pressure<sup>9</sup>.

The indications of ETS are deterioration of oxygen saturation and arterial blood gas values, visible secretions in the airway, acute respiratory distress, and suspected aspiration of gastric or upper air way secretions<sup>10</sup>.

Airway suctioning is one of the most common interventions for patients with respiratory disorders and having adequate knowledge in implementing this technique is quite crucial for nurses<sup>11</sup>.

Exploration of nurses knowledge and competence in acute and high dependency ward areas, was demonstrated a poor level of knowledge for many subjects regarding endotracheal tube suction<sup>12</sup>.

The general objective of this study was to assessment of nurses' knowledge toward endotracheal tube suction in Najran Hospitals at Najran City, Saudi Arabia.

## **METHODS**

### **Study Design**

This is a cross-sectional study, which analyses data from a nurse's to assess knowledge about endotracheal tube suction in Najran Hospitals, At Najran City, Saudi Arabia 2022.

### **Study Population**

The study population consisted of the nurses with various who are working in departments of (Emergency and Intensive Care Unit ICU) at Najran Hospitals on a permanent or contract basis during study period, was inviting to participate in the study.

### **Study setting**

Najran Hospitals, at Najran City, which serves as the regional capital of Najran, Saudi Arabia. The study was conducting in in departments of (Emergency and Intensive

Care Unit ICU) at Najran Hospitals (King Khalid hospital, University hospital, and General Najran hospital).

### **Sample Size**

Following their agreement to conduct the research, all nurses working in the previously specified units were chosen (102 nurses).

### **Sampling Technique**

Convenience sampling method was used, all nurses those working in the study setting who had an educational certificate with various nationalities and whom had a duration of working about one year and more. The participants of this study were included from departments of emergency and intensive care unit.

### **Data collection tool**

A self-administered questionnaire was used to collect data to assess nurses knowledge toward endotracheal tube suction. The questionnaire consists of seventeen questions



and nurses' informed consent. Two professionals prepared the questionnaire in English and translated it into Arabic utilizing translation and back-translation method.

### Data Processing and Analysis

The researchers were utilizing statistical analysis of these data kinds with a pre-packaged computer analysis application called the statistical package for the social science (SPSS 21). The frequency, proportion, mean, and standard deviation of numerical variables were used of descriptive statistics measures.

### Ethical Considerations

A formal approval was obtained from the relevant administrative setting. The researchers personally met each nurse under investigation, describing the study's aims and methods.

## RESULTS

In this study, nurses' competence of endotracheal tube suction in Najran Hospitals in Najran City, Saudi Arabia, was evaluated.

102 nurses working in intensive care units and emergency rooms make up the study sample.

In terms of training programs for endotracheal tube suction, 78.4% of nurses had them, while 21.6% did not.

According to the results of an assessment of nurses' endotracheal tube suction (ETS) knowledge, 75% of nurses correctly identified when endotracheal tube suction was necessary, followed by 62% of nurses who correctly identified endotracheal tube suction complications, and only 39% of nurses correctly identified when subglottic suction was necessary. On the other hand, more over half 56% of nurses got the right response in terms of their overall knowledge of endotracheal tube suction as shown in *table 1*.

The relationship between demographic attributes of nurses and overall level of knowledge of endotracheal tube suction (ETS), as shown in *table 2*, there is a significant correlation between the overall level of knowledge of endotracheal tube suction (ETS)

**Table 1: Assessing of nurses' knowledge regarding endotracheal tube suction (ETS).**

Nurses' Knowledge regarding Endotracheal Tube Suction ETS	Correct answer		Incorrect answer	
	F	%	F	%
1. Knowledge regarding the ideal definition of endotracheal tube suction	58	57%	44	43%
2. Knowledge regarding indication of endotracheal tube suction	77	75%	26	25%
3. Knowledge regarding equipment are needs for endotracheal tube suctioning	59	58%	43	42%
4. Knowledge regarding subglottic suction	40	39%	62	61%
5. Knowledge regarding best type of endotracheal suction is (open or closed systems).	50	49%	52	51%
6. Knowledge regarding dispose a suction catheter.	61	60%	41	40%
7. Knowledge regarding recommendation to frequency of ETS	51	50%	51	50%
8. Knowledge regarding important measures must be performed before endotracheal tube suctioning, to reduce risk of infection	58	57%	44	43%
9. Knowledge regarding the ideal and recommended duration of suctioning	57	57%	45	44%
10. Knowledge regarding complications of endotracheal tube suction	63	62%	39	38%
11. Knowledge regarding recommended endotracheal tube suction pressure	55	54%	47	46%
Total of correct answer	57	56%	45	44%



**Table 2: Association between demographic characteristics of nurses and overall level of knowledge regarding endotracheal tube suction (ETS).**

Demographic characteristics of nurses		Level of nurses knowledge			P-Value
		Good knowledge	Moderate knowledge	Poor knowledge	
		%	%	%	
Hospital Name	King Khalid Hospital	12.0%	49.3%	38.7%	0.032
	Najran General Hospital	0.0%	71.4%	28.6%	
	University Hospital - Najran	0.0%	92.3%	7.7%	
Sex	Male	8.6%	54.3%	37.0%	0.290
	Female	9.5%	71.4%	19.0%	
Level Education status	Diploma degree	5.3%	57.9%	36.8%	0.732
	Bachelor's degree	9.3%	57.3%	33.3%	
	Master's degree	14.3%	71.4%	14.3%	
	Doctorate degree	0.0%	0.0%	100.0%	
Years of Experience	1 to 3 years	13.7%	54.9%	31.4%	0.280
	4 to 5 years	0.0%	67.9%	32.1%	
	6 to 7 years	0.0%	44.4%	55.6%	
	More than 7 years	14.3%	57.1%	28.6%	
Did you receive any training courses in endotracheal tube suction?	Yes	8.8%	52.5%	38.8%	0.05
	No	9.1%	77.3%	13.6%	

and demographic traits of nurses, such as hospital name and whether or not you have taken any training courses in endotracheal tube suction at that facility (p-value 0.032; 0.05). The general degree of knowledge about endotracheal tube suction (ETS) and other demographic characteristics of nurses do not significantly correlate with one another.

## DISCUSSION

All nurses must possess a thorough understanding of tracheostomy suctioning and its significance in order to perform endotracheal tube suctioning efficiently<sup>13</sup>. Although secretion suctioning from an endotracheal tube is a high-risk procedure, it carries an even higher risk for seriously unwell children, there isn't enough scientific data to support this recommendation<sup>14</sup>. The knowledge and practice of intensive care unit nurses regarding endotracheal tube suctioning is directly

related to minimizing the aforementioned complications, improving standard care, promoting effective/safe suctioning, and reducing length of stay in intensive care unit ICU. Inadequate knowledge, variation in practices, and poor suctioning technique may lead to nosocomial infections, prolonged hospitalization, airway complications, and even death<sup>15</sup>. In order to evaluate nurses' competence of endotracheal tube suction in Najran Hospitals in Najran City, Saudi Arabia, the current study is being conducted. The researchers provide the study's key findings in this chapter and examine them in light of related research by other researchers.

In the current study, it was found that 79.4% of nurses were male, 73.5% had bachelor's degrees, 50% of nurses had experience ranging from one to three years, yet 78.4% had taken courses in endotracheal tube suction.

According to study's findings, 75% of participants had the most overall knowledge about endotracheal tube suction, followed by 62% of participants who knew the most about complications, 57% of participants who knew the most about crucial steps to lower infection risk, and more than half (56%), who knew the most about endotracheal tube suction. Finally, 57.9% of those who knew something about endotracheal tube suction had moderate knowledge, whereas 33.3% had little or no information.

A significant relationship between nurses' demographic characteristics, such as Hospital Name and training courses at ( $p$ -value 0.032; 0.05), and their general level of expertise about endotracheal tube suction (ETS).

Findings are discussed together with related research from at least seven other researchers. The first research<sup>4</sup>, which indicated that there is no significant correlation between working experience and levels of knowledge and practice, found that 35.7% of nurses have two months to one year of work experience, 85.7% have bad knowledge, and 76.7% have fair practice. According to the second research<sup>12</sup>, several respondents had inadequate understanding of endotracheal tube suction. On the other hand, these results are in conflict with those of the present research.

Only 4.3% of all respondents in the third research had strong understanding of ETS, compared to 52.2% who had fair knowledge and 43.5% who had poor knowledge<sup>5</sup>. Significant correlations were found between respondents' degree of ETS knowledge and their ethnicity ( $p=0.049$ ) and professional background ( $p=0.028$ ). The majority of nurses had limited understanding of the ETS.

According to the fourth research<sup>16</sup>, the majority of ICU nurses 69.9% were aware of the procedure's justification, while 80.6% showed unfavorable general understanding of ETS evidence-based recommendations. While all other variables were unaffected, nurses with ICU training 57.3% substantially

displayed greater understanding of ETS than nurses without this experience ( $P 0.005$ ).

In the fifth study, it was revealed that 66.3% of respondents were over the age of 20, 82.1% had earned a proficiency certificate level in nursing, 76.8% had worked in critical care units for more than six months, and a total of 55.8% had adequate knowledge of endotracheal suctioning, with a mean percentage of 61.6%. Working in a hospital and working in a ward were both significant influencing factors for the amount of endotracheal suctioning expertise ( $P= 0.001$ )<sup>17</sup>.

According to the sixth study the knowledge of ICU nurses was found to be fair in 49.0% of cases and bad in half the time 51.0%<sup>18</sup>.

In the seventh study, the majority of nurses were between the ages of 20 and 29 60% and were mostly male. The majority of them 54% had graduated from nursing school, while 34% had worked in intensive care units for less than one year. The majority of them 58 had worked in nursing for between one and five years, and 58% had training sessions in intensive care units. Their knowledge and practice are not significantly correlated with each other, and their levels of knowledge better than their levels of practice<sup>19</sup>.

## CONCLUSION

We conclude more than half 57.9% had moderate level knowledge, while 33.3% had poor knowledge. Study emphasizes to providing a written update guideline for endotracheal tube suction in study setting to ensure enough nurses' knowledge.

### Data Availability Statement

The corresponding author can provide the data described in this study upon request. Due to privacy considerations, the data are not publicly accessible.

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**Conflicts of Interest''** The authors declare no conflict of interest.

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# Analysis of Breast Cancer Open Access Learning Platform using Fink's Taxonomy of Significant Learning

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## ABSTRACT

In today's digitalized world, little is done to implement multidisciplinary breast cancer curricula through online learning platforms. More is needed to analyze these platforms pedagogically. Breast cancer education among healthcare professionals requires multidisciplinary collaboration. Using an open-access learning environment gives students and healthcare professionals opportunities to improve and deepen their knowledge about breast cancer care and therapy using evidence-based knowledge. This article aims to analyze the massive open online course (MOOC) platform of interprofessional cooperation in the breast cancer therapeutic phase (ICBCTP) using Fink's taxonomy of significant learning: foundational knowledge, application, integration, human dimension, caring, and learning how to learn. This research analysis will also discuss the phases of the curriculum development of the learning platform and the corresponding modules, themes, and sub-themes in an attempt to help learners achieve the competencies required by the field of expertise. Fink's taxonomy of significant learning provides a theoretical framework for developing the learning platform through human connections and interactions with learners from various professional and educational backgrounds.

**Keywords:** Breast Cancer; Cancer Education; Nursing; Nursing Education; Professional Development; Multidisciplinary Team; Interprofessional Approach; Breast Health.

## INTRODUCTION

Clinical nursing skills are considered one of the nurses' most important core competencies. Skills, knowledge, and competencies in medical-surgical nursing are vital in shaping the standards of nursing education in Europe. Understanding cancer, especially breast cancer, requires interprofessional cooperation across social and healthcare services. However, there are a limited number of academic programs designed explicitly for cancer nursing practice, which implies inadequacies in developing, implementing, and evaluating

education programs.<sup>6</sup> In 34 European Nations, only 55% have specialist breast cancer units with access to multidisciplinary treatment, which is inadequately dispersed throughout each country with varying accreditation standards<sup>5</sup>.

In patients with advanced breast cancer, nurses play an essential role in providing insight into the patient's experiences in various therapeutic and medical circumstances. As frontline healthcare professionals, nurses are in a position to coordinate with an oncologist specializing in breast cancer to understand the



patient's adverse effects of the treatment to provide proper interventions to the patient's needs. Patients discuss their fears, worries, and anxieties with nurses, especially on how to improve their relationships with the surrounding environment<sup>15</sup>.

The participation of nursing experts with experience in the medical-surgical nursing curriculum is to ensure that breast cancer education in nursing is represented. The platform aims to create continuing professional development accessible publicly to healthcare professionals involved in breast cancer patients in the therapeutic phase. Furthermore, the intended significant impact is to improve and harmonize the educational quality of breast cancer at a multidisciplinary level that can be used by healthcare organizations and higher education institutions to educate healthcare professionals. Studying from the platform at an individual level allows nurses or nursing students to understand the work of each participating healthcare professional of a patient under the breast cancer therapeutic phase. In some developing countries, nurses' knowledge about breast cancer risk factors and early detection methods is considered limited<sup>1,2,13</sup>.

The inclusion of breast cancer concepts in the nursing curriculum can be achieved with collaboration between higher education providers and healthcare institutions. Little is done to implement breast cancer curricula at a multidisciplinary level using online learning platforms in the digitalized world. However, more is needed to analyze these platforms pedagogically.

This article aims to analyze the massive open online course (MOOC) platform of interprofessional cooperation in the breast cancer therapeutic phase (ICBCTP) using Fink's taxonomy of significant learning: foundational knowledge, application, integration, human dimension, caring, and learning how to learn<sup>8</sup>. Furthermore, this will discuss the construction process of the online learning environment by describing the steps for creating the materials based on evidence-based practice.

## DISCUSSION

Fink's taxonomy of significant learning (Figure 1) has been used in analyzing e-learning environments and curricula in nursing, medical, and pharmacy education curriculums<sup>4, 10, 11, 13</sup>. It is a theoretical framework that can be used for developing course objectives as well as a foundation for assessing student learning<sup>8</sup>. This framework is used to understand better the learning modules of the breast cancer open-access learning platform and how students can be assessed using the list of taxonomies.

### Foundational knowledge

The self-paced online learning platform of the ICBCTP utilizes the current evidence-based practice knowledge as a foundation to create the information and ideas necessary for learners to learn<sup>8</sup>. As the platform uses scientific and medical terminologies, students must understand the basic knowledge of breast cancer, including the human anatomy of the breast, stages of breast cancer, signs and symptoms, and pathophysiology. Without a proper understanding of the essential concepts of breast cancer, it would be challenging to advance the knowledge in understanding the role of other healthcare professionals involved in the patient's care. In one study, nurses were found to have a high understanding of the signs and symptoms of breast cancer but had inadequate knowledge of the disease's risk factors<sup>3</sup>. Breast cancer screening was also uncommon among them<sup>3</sup>.

### Application

In the healthcare field, healthcare professionals must use critical thinking skills and analysis<sup>4</sup> in the plan of care to ensure that patient's individual needs are properly attended to. In this category, students are advised to engage in new actions that would activate their intellectual, physical, and social learnings to develop specific skills and manage complex activities<sup>8</sup>. As this is a self-paced online learning platform, monitoring the nurses' and nursing students' development of new skills can be



done by obliging them to put into writing what they are thinking<sup>11</sup>. In this case, as the website does not have course administrators, nurses or nursing students participating in the course can be assigned by the nurse manager or tutor teachers by creating a group using workspace collaboration or messaging application controlled by the healthcare organization or higher education provider to have a chat room or group discussion for their project works.<sup>11</sup> In addition, the platform can also add a learning diary application that stores the student's personal learning, which can be visible for others to see and comment on.

### Integration

The principles of constructivism are considered the foundation of e-learning by utilizing previous knowledge in the learning environment<sup>11, 12</sup>. It is implicated that nurses who are active students and, at the same time, active workers in the clinical field learn more because of the learned experiences brought. Students are also encouraged to share their experiences on the e-learning platform<sup>11</sup>. The platform provides a series of case examples and perspectives from healthcare professionals in nursing, radiographers, pathologists, and

biomedical laboratory scientists so learners without experience in breast cancer nursing can get the essential points on how a healthcare team works in breast cancer treatment.

### Human Dimension

As the ICBCPTP platform can be accessed worldwide, learners from across geographical locations communicate, analyze, and synthesize utilizing asynchronous and synchronous communication methods. Virtual learners utilize their computers to work in a shared learning space to achieve a common learning goal based on the goals of the modules<sup>12</sup> by solving conflicts brought by previous knowledge, knowledge gaps, and new ideas<sup>4</sup> in breast cancer patients under the therapeutic phase. To obtain information, students work together with other virtual learners to understand the themes of each module concerning breast cancer that is specific to their field of expertise.

Interested nurses and nursing students are tasked to create a profile by registering into the system so that learning progress can be followed. Learners are encouraged to change their profile photo, profile cover, and professional background or studies related to their specific field of expertise. Based on this taxonomy, it is encouraged to create a profile by registering into the system so that learning progress can be followed. Learners are encouraged to change their profile photo, profile cover, and professional background or studies related to their specific field of expertise<sup>11</sup>.

### Caring

The motivation to study is an important factor in the success of learning online. Students must care about studying the subject<sup>11</sup>. Learning online requires good time management, intrinsic motivation, and determination<sup>9</sup>. Learners must show interest in studying breast cancer not online, specific to their field, but also in understanding the perspectives of other healthcare professionals.



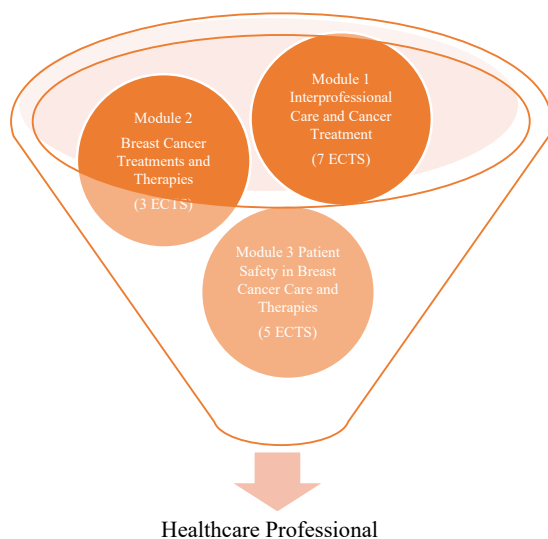
**Fig. 1: Fink's Taxonomy of Significant Learning on the application of Breast Cancer Education using E-Learning Platform**

Nursing is a profession that collaborates with a multidisciplinary team to treat breast cancer patients.

Educators and nurse managers can require nursing students and staff members to do reflective journals<sup>11</sup> to stimulate the caring attitude of the learners concerning breast cancer due to the complexity of the topics. Online learning provides simpler opportunities for students to do self-reflection<sup>8</sup> and record their private reflections on their personal computers or with the aid of a plug-in tool.

### Learning how to Learn

Using an e-learning platform can be frustrating due to technical difficulties. Troubleshooters or IT specialists should be available<sup>11</sup> for learners who have difficulties accessing the platform. As this requires registration to create a learner's profile, an IT administrator is designated to solve technical problems. Educators and partner healthcare organizations are given administration rights to access the website in case materials need to be updated. Project coordinators' contact information is also readily made available for clarification.



(Nurses, Biomedical Laboratory Scientists and Radiographers)

**Fig. 2: Modules and Corresponding Contents Leading to Advanced Knowledge in Breast Cancer for Healthcare Professionals**

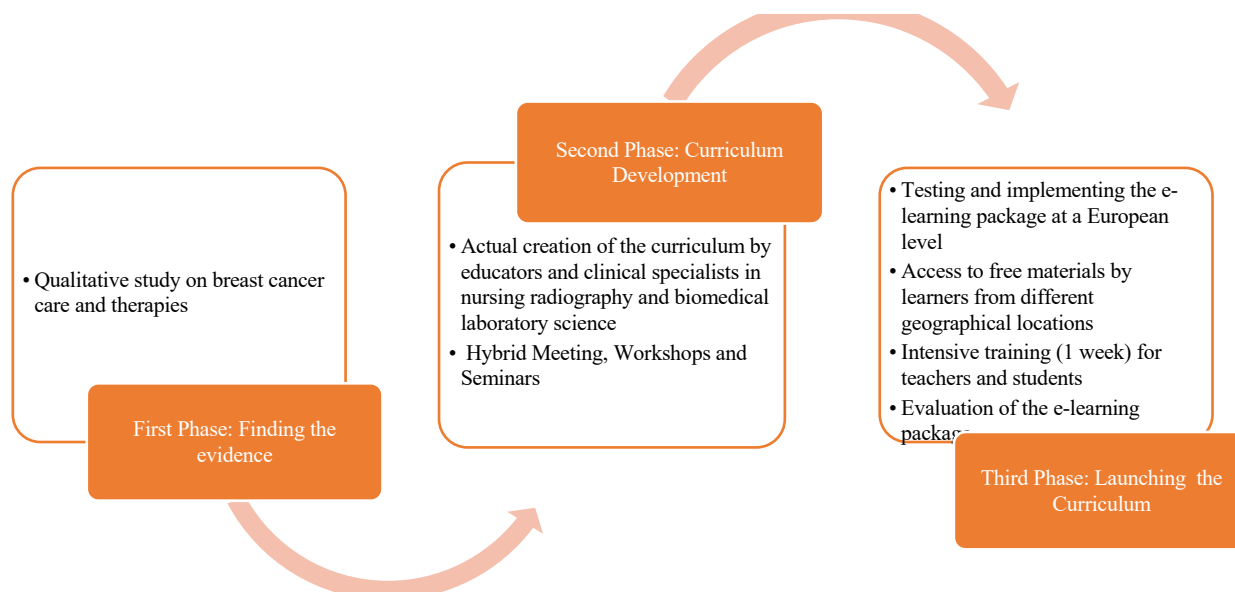
### Developing the Massive Open Online Course (MOOC) platform

The platform consists of three main modules with the corresponding sub-topics in a multidisciplinary approach, including nurses, radiographers, and biomedical scientists<sup>7</sup>. The materials are based on evidence-based practice and are collated with corresponding feedback from participating university partners, healthcare organizations, and outside experts. Constant meetings, discussions, brainstorming, and seminars are conducted to plan the curriculum accordingly to create a learning package applicable to the target group of healthcare professionals, including nurses.

The first phase in drafting the curriculum is to ensure that current evidence-based data exist to support the creation of the platform<sup>7</sup>. This was done by conducting an integrative literature review, observational study, and qualitative questionnaire study to generate new research knowledge in tackling breast cancer in the therapeutic phase in an interprofessional approach. While the generation of new research data is simultaneously conducted, healthcare professionals in their field of expertise create learning tools and materials by using evidence-based materials.

The second phase is the creation of curriculum<sup>7</sup> based on the help of educators and clinical specialists in nursing, radiography, and biomedical laboratory science. Each participating organization has dividends of tasks based on the education and experience profile of the specialists. Constant meetings (virtual, face-to-face, and hybrid), brainstorming, seminars, and workshops are performed to develop materials shown on the platform. The platform uses recorded lectures, presentation tools, and plug-in tools to discuss the related themes of each module.

The last phase is testing and implementing the e-learning package at a European level<sup>7</sup>. Selected students preliminarily test the platform by taking short quizzes and giving feedback using the questionnaires after



**Fig. 3: Phases of Curriculum Development in Online Breast Cancer Education**

each theme. Evidence-based materials are also linked in each theme to further their understanding of the topic. Members of the participating organizations continuously deliberate the improvements of the e-learning platform with the help of a steering committee. Training for educators and students is provided in navigating and guiding students on how to use the platform, which is made available for global use.

## CONCLUSION

The breast cancer open-access learning platform provides opportunities for learners, not only nursing students and nurses but especially allied health professionals such as radiographers, radiotherapists, and biomedical laboratory scientists to understand breast cancer treatment on a multidisciplinary level. Open-access materials can reach students from different geographical locations without hardships and barriers. Fink's taxonomy on significant learning provides a theoretical framework on how the learning platform can be developed using human connections and interactions with learners of different professional and educational backgrounds. With the help of evidence-based knowledge, a curriculum is developed that gives free access to healthcare education- an advantage for learners in low-and-middle-income countries.

**Conflict of Interest:** The author declares no conflict of interest.

**Ethical Clearance:** The research does not require ethical clearance.

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# Intravenous Infiltration and Extravasation: Performance of Nurses at Paediatric Hospitals in Khartoum State in 2019

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## ABSTRACT

**Aim:**Prevention is the best method for decreasing morbidity from peripheral intravenous infiltration and extravasation. The study aimed to study nurses' performance regarding intravenous infiltration and extravasation.

**Method:** This descriptive cross-sectional hospital-based study was conducted at four paediatric hospitals in Khartoum state. In total, 165 nurses were included using a simple random sampling of different working experiences. Data were collected using an observational checklist and analysed using the statistical packages for the social sciences (SPSS) version 20.

**Results:**Most of the nurses (72.8%) did not flush 0.9% saline to assess cannula function; all nurses in the present study covered the insertion site with non-transparent plaster, and more than half (57.6%) diluted vesicant medication with a lesser amount than required. There was a statistically significant association between qualifications and practice scores ( $P=0.001$ ).

**Conclusion:**This study showed that nurses had a poor level of practice regarding intravenous infiltration and extravasation.

**Recommendation:** We recommend education, guidelines, and standards for infusion therapy. Additionally, a supervisory system should be created to ensure best practices.

**Keywords:** prevention, intravenous infiltration, extravasation, performance .

## INTRODUCTION

Nurses are expected to maintain competence in peripheral intravenous site care to enhance patient outcomes and prevent potentially life-threatening complications, and this is a technically difficult and complicated procedure that needs to be performed successfully <sup>(1)</sup>. Intravenous infusion therapy is associated with many complications, including infiltration and extravasation <sup>(2)</sup>. Intravenous infiltration is the leakage of a non-vesicant solution into the surrounding tissues, while extravasation is the inadvertent leakage

of a vesicant solution into the surrounding tissues. A vesicant refers to any medication or fluid with the potential to cause blisters, severe tissue injury, or necrosis. The concentration of vesicant, amount extravasated, and type of vesicant are all factors that influence the severity of extravasation. Prevention of infiltration and extravasation begins with choosing an appropriate IV-gauge, careful site selection, frequent visual assessment, vein patency, comparison of the two extremities, and recognition of the signs and symptoms of infiltration and extravasation. During site

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selection, areas of flexion and pain on palpation should be avoided. Peripheral or central venous access devices are flushed before each infusion as a step for assessing the catheter and preventing contact between incompatible medications<sup>(3)</sup>. The intravenous cannula site should be covered with a transparent dressing, which helps secure the site and makes it visible at all times<sup>(4)</sup>. The tape or plaster should not be wrapped around the extremity, as this could result in a tourniquet effect<sup>(5)</sup>. Many practitioners' peripheral intravenous catheter knowledge and insertion skill deficits have been identified, including patient assessment, insertion site selection, catheter selection, and insertion, catheter securement, dwell time, complication identification and treatment, compliance with best practice guidelines, and the need for effective educational strategies<sup>(6)</sup>. In 2012, the Infusion Nurses Society (INS) released a position paper on the frequency of peripheral catheter site assessment. Observation of the insertion site is recommended every 1–2 h based on the type of fluids and medications being administered<sup>(7)</sup>. The Centre for Disease Control and Prevention Guidelines for the Prevention of Intravascular Catheter-Related Infections recommend replacing peripheral catheters in children only when clinically indicated<sup>(8)</sup>. Accurate documentation of infiltration and extravasation is vital for facilitating patient care and litigation. Documentation is the key to effective legal defence in the event of a medicolegal claim<sup>(9)</sup>. The outcome of infiltration and extravasation can range from oedema in an extremity to full-thickness skin loss, muscle or tendon necrosis, and, in some cases, amputation<sup>(10)</sup>, leading to prolonged hospitalisation and increased medical costs<sup>(11)</sup>. Nurses need to improve their practice and knowledge through specific education and training, to provide high-quality and effective health care for patients<sup>(12)</sup>. It is also important to assess nurses' abilities to create positive changes in their knowledge and practice. The number of studies on intravenous infiltration and extravasation among children in Sudan is limited. Therefore, this study aimed to

examine nurses' performance regarding the prevention of infiltration and extravasation in paediatric hospitals.

## METHODOLOGY

This descriptive cross-sectional hospital-based study was conducted at paediatric governmental hospitals in Khartoum state: Ahmed Gasim Paediatric Hospital, Mohammed Elamin Hamid Paediatric Hospital, Gafaar Ibnuof Paediatric Hospital, and Albluck Paediatric Hospital. Using a simple random sampling technique, 165 nurses were included in this study, regardless of their qualifications and years of experience, and the sample size was calculated based on the total population. The variables studied were cannula size, site selection, flushing, security of the insertion site, documentation of cannula insertion, and the touch, look, compare (TLC) method. Data were collected using an observational checklist to assess skills related to preventive measures for infiltration and extravasation based on the Infusion Therapy Standards of Practice and analysed using the statistical packages for the social sciences (SPSS) version 20. The practical skills were scored from 1–3, with 3 indicating good if the skill was performed correctly, 2 indicating fair if the skill was not performed correctly, and 1 indicating poor if the skill was not performed. Data are presented in the form of a simple frequency table and a cross table to explore the relationships between variables. Statistical significance was set at  $P \leq 0.05$ . Ethical approval was obtained from the ethics committees and administrative authorities of the hospitals.

## RESULTS

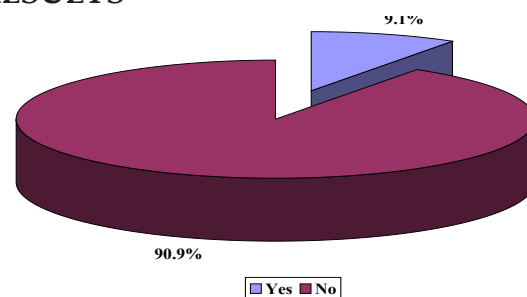


Fig. 1. In-service training on intravenous therapy (N =165).

## DISCUSSION

This study illustrated that only 9% of nurses received a training course on intravenous

**Table 1. Characteristics of the study participants(N=165)**

Demographic	Frequency	Percentage
<b>Age</b>		
20–30 years	11	6.70%
31–40 years	92	55.80%
41–50 years	39	23.60%
>50 years	23	13.90%
<b>Nurses' qualifications</b>		
Certified nurse	57	34.50%
Diploma	71	43.00%
Bachelor	31	18.80%
Master	6	3.60%
<b>Gender</b>		
Male	30	18.20%
Female	135	81.80%
<b>Years of experience</b>		
1–5 years	11	6.70%
6–10 years	31	18.80%
11–15 years	86	52.10%
>15 years	37	22.40%
<b>Total</b>	<b>165</b>	<b>100%</b>

**Table 2: Association between nurses' qualification and assessment of cannula function (N =165)**

Qualification		Assessment of cannula function			
		Not done	Done not correctly	Done correctly	Total
Certified nurse	count	57	0	0	57
	%	0%	0%	0%	100%
Diploma	count	36	29	6	71
	%	50.7%	40.8%	8.5%	100%
B.Sc.	count	24	3	4	31
	%	77.4%	9.7%	12.9%	100%
M.Sc.	count	3	1	2	6
	%	50%	16.7%	33.3%	100%
Total	count	120	33	12	165
	%	72.7	20	7.3%	100%

P-value=0.001

complications, which is in disagreement with the study conducted by Ajani, who mentioned the importance of educational programmes and training <sup>(11)</sup>. The findings revealed that most of the nurses (61.2%) used the smallest-sized cannula (24gauge) more frequently. Similar to a study by Alexander, a small-gauge catheter results in fewer traumas to the vein <sup>(3)</sup>, and small cannulas are preferable and available in paediatric hospitals. In total, 30.9% of nurses inserted cannulas from distal to proximal, as starting from distal saves more proximal veins for future use. Moreover, the study revealed that 20% of the nurses had committed malpractice in that they flushed peripheral cannula with sterile water. Sterile Water for Injection, a unique selling proposition (USP), is a haemolytic agent and is contraindicated for intravenous administration due to the nurses' lack of education concerning intravenous therapy. All nurses in the present study covered the insertion site with non-transparent plaster, and this practice is not in line with the INS practice criteria, as the site of peripheral catheter insertion should be covered with a transparent plaster to allow visibility of the site. However, transparent plasters, which help in the prevention and early detection of infiltration and extravasation, are not

**Table 3. Distribution of the nurses according to preventive measures for IV infiltration and extravasation (N =165)**

Items	Not done		Not done correctly		Done correctly	
	N	%	N	%	N	%
Select the smallest-gauge	27	16.4	00	0.0	138	83.6
Avoid area of flexion	130	78.8	00	0.0	35	21.2
Start from distal to proximal	89	53.9	00	0.0	76	46.1
Insert cannula on first attempt	86	52.1	00	0.0	79	47.9
Assess catheter function by flushing 0.9% saline	120	72.7	33	20	12	7.3
Insertion site visible with transparent plaster	165	100.0	0.0	0.0	0	0.0
Plaster tape not circumferential	165	100.0	0.0	0.0	0	0.0
Monitoring site hourly for oedema and discoloration	112	67.9	49	29.7	4	2.4
Documentation of cannula insertion	165	100.0	0	0.0	0	0.0
Dilute vesicant medications appropriately before administration	0	0.0	95	57.6	70	42.4
Flush cannula after each infusion to clear the infused medication	162	98.2	0.0	0.0	3	1.8
Perform TLC hourly: touch insertion site for coolness and pain; look for signs of swelling, blanching, and blister at the insertion site; and compare both extremities every hour	165	100.0	0.0	0.0	0.0	0.0

available in governmental paediatric hospitals in Khartoum state. All nurses in this study applied plaster tape circumferentially, and a study conducted by Amjad reported that circumferential taping had a tourniquet effect and that tight taping could worsen the effects of infiltration<sup>(5)</sup>. Nurses in this study monitored the insertion site hourly for signs of oedema and discoloration, contrary to Gorski's recommended frequency of every 1–2 h based on the type of fluids and medications administered<sup>(7)</sup>. None of the nurses in this study documented cannula insertion. A study conducted by Raveesh suggested that documentation is the key to an effective legal defence in the event of a medicolegal claim<sup>(9)</sup>. More than half (57.6%) of the nurses diluted medications with a lesser amount than required, and the concentration of vesicants is an influencing factor for extravasation severity.<sup>(9)</sup> However, in the study conducted by Amjad, the medical

staff were asked to notify the pharmacy when using a short peripheral cannula so that dilutions could be adjusted for administration<sup>(5)</sup>. In paediatric hospitals in Khartoum state, the use of short peripheral cannulas was common, and nurses were in charge of mixing and diluting medications, not pharmacists. The current study showed significant differences in practice scores with regard to nursing qualification ( $P=0.001$ ).

## CONCLUSION

This study showed that the performance of nurses in the prevention of infiltration and extravasation was poor.

## RECOMMENDATION

We recommend adherence to standards and guidelines for infusion therapy. In addition, a supervisory system should be created to ensure best practice.



**Ethical clearance-** Ethical approval was obtained from ethical committees and administrative authorities of hospitals.

**Source of funding-** Self only

**Conflict of Interest:** Nil

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# Nurses' Compliance with Standard Precautions Regarding Infection Control at Eldaein Teaching Hospital, East Darfur state 2021

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## ABSTRACT

**Introduction:** Staff nurses play an important role in prevention of infection of patients by paying careful attention to hand hygiene, ensuring careful administration of prescribed antibiotics and by following procedures to reduce the risks associated with patient care devices.

**Aim:** To evaluate compliance of nurses regarding standard precautions of infection control. **Method:** Descriptive cross-sectional hospital-based study was conducted at ELdaein teaching hospital. The sample consisted of 60 nurses. Data was collected through observational checklist.

**Result:** nurses' compliance with standard precautions of infection control was good Mean  $\pm$  SD (2.92, 0.512).

**Conclusion:** The nurses had a good level of compliance with standard precautions of infection control while most of nurses were not compliance with washing hands before wears gloves, wear masks and protective eye patch or goggle when performing operations/procedures that might induce spraying of blood, body fluid, secretions, and excretions due to lack of personal protective equipment. The findings suggest the important of continuous teaching, training, and workshop courses to improve nurses' compliance with standard precautions of infection control and to supply all personal protective equipment which helps the nurses to comply with standard preparations of infection control.

**Keywords:** nurses' compliance, standard precautions, infection control, Nurses' adherence, personal protective equipment.

## INTRODUCTION

Infection control is a scientific approach and practical solution designed to prevent harm caused by infection to patient and health worker <sup>(1)</sup>. Standard precautions (SPs) are intended for use to prevent the transmission of infection from one source to another. SPs are intended to protect healthcare providers, patients, and supporting staffs from nosocomial infections and occupational hazards. Healthcare associated infections

(HAIs) are the main cause of morbidity and mortality associated with clinical, diagnostic and therapeutic procedures. HAIs are not only a threat for healthcare workers (HCWs) but also a threat for service users and patients. HAIs are infections that spread from one individual to others through a variety of ways. The most important spreading mechanism of these pathogens is via contaminated hands of the healthcare provider to the other healthcare provider, to patients or attendants of the

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patients. The most important circumstances that a healthcare provider to be a risky group in any healthcare setting for HAIs are during direct patient care, instrument processing, surgical procedures, healthcare waste disposal, and processing patient care items<sup>(2)</sup>.

Healthcare-associated infections, or “nosocomial” and “hospital” infections, affect patients in a hospital or other health-care facility, and are not present or incubating at the time of admission. They also include infections acquired by patients in the hospital or facility but appearing after discharge, and occupational infections among staff<sup>(3)</sup>.

The Center for Disease Control (CDC) estimates that approximately one-third of all nosocomial infections could be prevented with an effective infection control program<sup>(4)</sup>. The CDC in 1996 introduced a revised version of a preventive concept against nosocomial infections that originated in the 1960s. It advocates basic standard precautions for all healthcare delivery and additional specific measures to protect healthcare workers and patients from exposure to potentially harmful microorganisms<sup>(3)</sup>. Routine practices essential to infection control such as aseptic techniques, use of single-use devices, reprocessing of instruments and equipment, antibiotic usage, management of blood/body fluid exposure, handling and use of blood and blood products, management of medical waste<sup>(5)</sup>. Compliance with the rules, largely set by applicable legislation, can help prevent the spread of hospital infections, protect patients, shorten the length of treatment, and thus reduce healthcare costs associated with inpatient and outpatient medical facilities and sanatoriums<sup>(2)</sup>. Infection control practices can be grouped into two categories standard precautions and additional (transmission-based) precautions<sup>(6)</sup>.

Standard precautions must be applied to all patients at all times, regardless of diagnosis or infectious status, and additional (transmission-based) precautions that are specific to modes of transmission (airborne, droplet, and contact)<sup>(6)</sup>. It aims to prevent transmission of infections from patient to health care

worker, health care worker to patient, patient to patient (cross-transmission), hospital environment to patient, and hospital waste to community spread. The standard precautions of infection control are hand hygiene, correct use of personal protective equipment, control of the environment<sup>(6)</sup>. The infectious agent is the types of microorganisms that cause infections, eg bacteria, viruses, protozoa, fungi, and helminthes<sup>(4)</sup>. Transmission-based precautions are a set of guidelines proposed for hospitalized patients who are known (or suspected) to be infected or colonized with highly transmissible or epidemiologically important pathogens. As these patients carry a high risk of transmitting the pathogen to the healthcare worker and adjacent patients, further measures are needed in addition to standard precautions to prevent transmission of infection. Usually, these patients must be isolated and the appropriate transmission-based precaution must be used<sup>(7)</sup>.

## MATERIAL AND METHODS

Descriptive cross-sectional hospital base study design. Conducted in Eldaein teaching hospital at East Darfur state -Sudan. Total coverage for 60 nurses. Data was collected through observational checklist

### Sample

Nurses (n 60) working in wards at Eldaein teaching hospital (medical-surgical, obstetrics-gynaecology ward, and paediatric ward) and met inclusion criteria.

### Data collection technique

A direct observation was carried out by researchers by using observation checklist regarding nurse's compliance with standard precautions of infection control.

### Statistical analysis

Data were collected, computerized, and statistically analyzed using the statistical package for the social sciences program (SPSS) version 24. Data analyzed including both

descriptive and inferential statistics. Data were presented using descriptive statistics in the form of frequencies, percentages, mean and standard deviation for the variable. The 0.05 level was used for statistical significance ( $P$  values  $\leq 0.05$ ).

### Ethical consideration

Ethical approval was obtained from the Review Committee of Karary University, Ministry of health in east Darfur and manager of Eldaein teaching hospital, and verbal consent from all participants.

The purposes of the study explained to the participants in a simple ward.

The privacy of participants was protected.

Participants participated involuntarily.

## RESULT

**Table (1)** show distribution of nurses according to demographic and occupational characteristics of nurses

In relation to nurses' compliance with standard precautions of infection control as illustrated in **Tables (2)**, demonstrate that overall all compliance of nurses was good Mean  $\pm$  SD (2.92, 0.512)

**Table 1: Demographic and occupational characteristics of nurses (n=60)**

Characteristics	Response	N	percent
Sex	Male	10	16.7%
	Female	50	83.3%
Age (years)	Less than 25	3	5.0%
	(26- 30)	11	18.3%
	(31-40 )	15	25.0%
	More than 40	31	51.7%
Scientific qualification	Secondary school nursing	45	75%
	Diploma	7	11.7%
	Bachelor	7	11.7%
	Master	1	1.7%
Experience (years)	Less than 2	4	6.7%
	(2-5)	23	38.3%
	(6-10)	31	51.7%
	More than 10 years	2	3.3%
Attending training program or workshop about infection control	Yes	34	56.7%
	No	26	43.3%



**Table 2: Nurses' compliance with standard precautions of infection control (n=60)**

S. No	Compliance Activity	Always	Usually	Sometime	Seldom	Never	Mean	SD
		N (%)	N (%)	N (%)	N (%)	N (%)		
1	Washes hands when comes in contact with different patients.	2(5%)	3(3.3%)	2 (5%)	9 (15%)	43(71.7)	1.48	0.245
2	Washes hands before wears gloves	2(5%)	5(8.3%)	3(3.3%)	12(20%)	38(63.3%)	1.68	0.197
3	Washes hands after taking off the gloves	6 (10%)	4(6.7%)	10 (16.7%)	21(35%)	19(31.7%)	2.28	0.172
4	Washes hands immediately after contacting any blood, body fluid, secretion, excretion and dirty substances.	13(21.7%)	35(58.3%)	7 (11.7%)	2(3.3%)	3(5%)	3.88	0.965
5	Wears gloves when drawing blood samples.	9 (15%)	11(18.3%)	32(53.3%)	7(11.7%)	1(1.7%)	3.33	0.610
6	Wears gloves when disposing stool and urine.	20(33.3%)	26(43.3%)	12(20%)	1(1.7%)	1(1.7%)	4.05	0.846
7	Wears gloves when handling impaired patient skin.	6(10%)	8(13.3%)	16(26.7%)	18(30%)	12(20%)	2.63	0.216
8	Wears gloves when handling patients' mucosa.	11(18.3%)	31(51.7%)	7 (11.7%)	7 (11.7%)	4(6.7%)	3.63	0.814
9	Wears gloves when given medications.	10 (16.7%)	8(13.3%)	26(43.3%)	14(23.3%)	2(3.3)	3.17	0.469
10	Wears gloves when dressing wounds.	30(50%)	21(35%)	4(6.7%)	4(6.7%)	1(1.7%)	4.25	1.078
11	Wears gloves when cleaning blood trace.	15(25%)	13(21.7%)	11(18.3%)	13(21.7%)	8(13.3%)	3.23	0.427
12	Wears gloves when comes in contact with blood.	6(10%)	10 (16.7%)	11(18.3%)	21(35%)	12(20%)	2.62	0.198
13	Uses aseptic technique when handling invasive device	9 (15%)	19(31.7%)	23(38.3%)	7 (11.7%)	2(3.3)	3.43	0.544
14	Wears mask when performing operations/procedures that might induce spraying of blood, body fluid, secretions and excretions	7 (11.7%)	5(8.3%)	15(25%)	13(21.7%)	20(33.3%)	2.43	0.179

S. No	Compliance Activity	Always	Usually	Sometime	Seldom	Never	Mean	SD	
		N (%)	N (%)	N (%)	N (%)	N (%)			
15	Wears protective eye patch or goggle when performing operations/procedures that might induce spraying of blood, body fluid, secretions and excretions.	1(1.7%)	3(5%)	2(3.3)	12(20%)	42(70%)	1.48	0.258	
16	Wears protective suit or gown when performing operations/procedures that might induce spraying of blood, body fluid, secretions and excretions.	4(6.7%)	5(8.3%)	13(21.7%)	8(13.3%)	3(5%)	1.63	0.214	
17	Do not recap syringe after using.	16(26.7%)	13(21.7%)	11(18.3%)	10 (16.7%)	10 (16.7%)	3.25	0.463	
18	Discard needles and blades in a sharp safety box after using.	38(63.3%)	7 (11.7%)	4(6.7%)	3(5%)	8(13.3%)	4.07	1.323	
	Overall compliance	58.5%						2.92	0.512

Overall Scale: mean (1-1.80) = poor, (1.81-2.60) = fair, (2.61- 3.40) = good, (3.41-4.20) =Very good, (4.21-5) = excellent.

There was insignificant association between nurses' compliance with standard precautions of infection control and scientific qualification, experience period and receiving training courses, P values significant at  $\leq 0.05$  as shown in **table (3)**

**Table 3: Association between nurses' compliance with standard precautions of infection control and Scientific qualification, Experience period and receiving training courses (n=60)**

Variables	Person correlation test		
	N	R	p-value
scientific qualification	60	0.215	0.099
Experience period	60	0.043	0.744
receiving training courses	60	0.011	0.931

P values significant at  $\leq 0.05$

## DISCUSSION

Compliance with standard precaution is essential for prevention of hospital associated infection.

In the current study, nurses' compliance with standard precautions of infection control was good Mean  $\pm$  SD (2.92, 0.512)

This result constant with the study done by Al-Rawajfah et al<sup>(8)</sup>, in Jordanian about compliance of Jordanian registered nurses with infection control guidelines.

An insignificant correlation between nurses' compliance with standard precautions of infection control and their scientific qualification, experience period, and attending training programs or workshops about standard precautions of infection control (P-Value  $> 0.05$ ); contrasting with the result of a study done by Peng Xiong et al<sup>(9)</sup> (2017) in teaching hospital in Hubei, china about effect of a mixed media education intervention

program on increasing knowledge, attitude and compliance with standard precautions among nurses.

## CONCLUSION

Nurses' compliance with standard precautions of infection control was good. There was insignificant correlation between nurses' compliance with standard precautions of infection control and their scientific qualification, experience period, and attending training programs or workshops about standard precautions of infection control. It is recommended for continuous teaching, training, and workshop courses to improve nurses' compliance with standard precautions of infection control and to supply all personal protective equipment which helps the nurses to comply with standard preparations of infection control.

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# Teenage Pregnancy Patterns and Experience in SidoonTown, River Nile state, Sudan, 2022

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## ABSTRACT

**Background:** Teenage is a stage of physical and mental human development that occurs between childhood and adulthood. Teenage pregnancy is a global public health problem that affects the physical and emotional health. Teenage pregnancy is linked with many risk factors that affect the health of the mother and the outcome, as spontaneous abortions, as well as neonatal and maternal mortality and morbidity. **Objective:** to study issues related to teenage pregnancy patterns and experience. **Methodology:** This study adopted a descriptive cross-sectional community-based design. The study was conducted among a sample of 205 women using the simple random sampling method of the teenagers living in Sidoon Town of the River Nile state. The data required for the purposes of the study were collected using structured face-to-face interviews. The data were analyzed using SPSS, version 23 and suitable descriptive and inferential statistical methods were used, and  $P < .05$  was accepted for statistical significance. **Results:** The majority of the participants (78%) were aged between 17-19 years, and those got married and had their first pregnancy between 14-16 years were 79% and 84.4% respectively. About half of the participants (53.2%) didn't complete their primary level school education. The results also indicated that 40.5% of the participants were subjected to forced marriage experience, whereas 59.5% had the right to choose. Pregnancy was experienced by 176 (85.9%) of the women, out of whom 159 (86.9%) delivered their babies vaginally, while C/S birth was found among 24 (13.1%) of them; abortion was experienced by 25.4% of them, most of which happened without a determined cause. Planning of pregnancy and using of family planning (FP) was found among 78 (38.5%) of the participants. The majority of them used hormonal FP without medical advice and 62 (78.8%) used combined pills. Teenage pregnancy associated morbidity was found among 59 women (gestational diabetes, pregnancy induced hypertension, preterm labor, post-partum depression and infection: 19, 13, 24, 3 and 1 respectively). Significant correlation was found between passive smoking and history of the abortion among women,  $P = 0.05$ .

**Conclusion:** Teenage pregnancy is linked with the participants' morbidity. Early pregnancy interferes with the continuation of the woman's education, and lack of awareness related to use of FP methods used was seen. **Recommendation:** Health education for the study community is needed to enhance their health awareness.

**Keywords:** Teenage, Pregnancy Pattern, Experience, Family Planning.

## INTRODUCTION

Teenage years are the best years of life; it is transitional period of human development with physical and mental, cognitive, social and emotional change that occurs between

childhood and adulthood. Nutrition, education, counseling and guidance are needed to ensure growth into healthy adults<sup>(1)</sup>. Teenage pregnancy is considered a public health problem by the World Health Organization

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(WHO), which recently developed evidence-based guidelines. WHO addressed six areas regarding teenage pregnancy, including the following: it affects the health of both mother and fetus pregnancy; child birth is almost always the leading cause of death among adolescents in low-income countries; the lack of counseling and education is a critical factor for high number of preterm pregnancies (2). Pregnancy and birth-related complications are the second leading cause of death among adolescents (3,4). It was also found that children born to teenage mothers had higher neonatal mortality than the children born to mothers in different groups (3). Apgar below seven in five minutes after delivery is associated to teenage mothers (5, 6). Girls in low-and middle-income countries (LMICs) constitute the majority (99%) of all maternal and neonatal deaths (7). In LMICs almost 140 million births take place each year. Teen pregnancy and the desire to have children is a contributing factor to high morbidity and mortality (8). Adolescents aged 15–19 years are responsible for a staggering 16 million births, while girls younger than 16 years of age are responsible for an estimated 2.5 million births (9). Teen mothers are less likely to graduate from high school and are more likely to live in poverty and have children who often suffer health and developmental issues (6). Understanding teenage pregnancy requires understanding social and biological factors that affect teenage pregnancy, such as: facing adversity in childhood and adolescence; behavioral and attention problems, family history, and precarious and poor educational success (7,8). Teenage births often have health consequences: children are often born prematurely; they have low birthweight; new born mortality is high. Mothers are less likely to develop postpartum depression and start breastfeeding (8,10). The highest rate of teenage pregnancy is in sub-Saharan Africa, which is often associated with early marriage, with one in four girls giving birth before the age of 18 years. South Sudan is among ten countries with the highest rate of teenage pregnancy (11). One third of South Sudanese girls start giving birth between the ages of 15-19, and 3% give birth

even before the age of 15 (12). It is worth noting here that South Sudan is part of Sudan and the customs, values and traditions are similar.

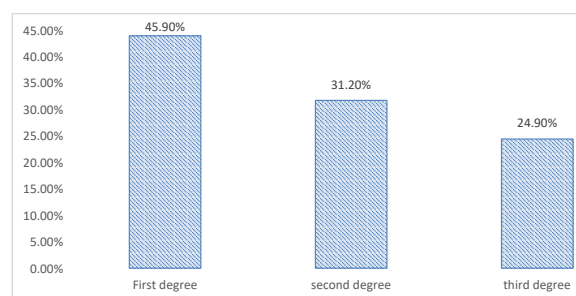
## Research Methods

This study adopted a community-based cross-sectional design and it was conducted in River Nile state (Sidoontown). The targeted population included married female teenagers living in Sidoon during the study period. The sample consisted of 205 married teenagers who were enrolled in the study, and they were selected by the simple random sampling technique. An ethical approval was obtained from the Institutional Review Board at Al-Neelain University and Khartoum State. A letter of approval was also obtained from the Municipality of Al-Damar, and an informed consent was obtained from each participant before the interview. The data were collected by interview questionnaire administered to determine the teenage pregnancy patterns and experience. The data were analyzed using the Statistical Package of Social Sciences (SPSS), version 16. and suitable descriptive and inferential statistical methods were used, and  $P < .05$  was accepted for statistical significance.

## RESULTS

The results reveal that; majority of the participants their age range between 17-19 years, 59.0% of them their age of marriage was between 14-16 years. More than half of them their education level primary school.

The figure 1 (bar chart) shows that the majority of the participants' husbands were



**Fig. 1: Distribution of husband's relationship among the participants (n=205)**

their relatives of first or second degree (45.6% & 31.2%) respectively.

As the table 1 displays, the majority of teenage women enrolled in the study did not plan their pregnancy and only 79 (38.5%) of

**Table (1): Distribution of the participants regarding pregnancy n=205**

Items	Frequency	Percent
Planning of pregnancy		
Planned	79	38.5
Unplanned	126	61.5
Using of family planning methods		
Yes	79	38.5
No	126	61.5
<b>Administration of family planning methods</b>		
Alone without medical advice	69	86.2
Through health care provider's instruction	10	13.8
<b>Types of methods</b>		
Intrauterine device	2	2.5
Implanon	3	3.8
Injection	9	11.2
Combined pills	62	78.8
Mini pills	2	2.5
Natural	1	1.2

**Table 2: Distribution of abortion patterns among the participants (n=205)**

Items	Frequency	Percentage%
<b>History of abortion</b>		
No	153	74.6
Yes	68	25.4
<b>Number of abortions</b>		
Only one	56	82.4
Two	12	17.6
<b>Cause of abortions</b>		
Infection	3	4.4
Fever	2	2.9
Medical disorder	3	4.4
Unknown	58	85.3
Therapeutic abortion	2	2.9

the participants planned it, and most of those who planned it used combined pills and they used it without medical advice. Furthermore, the majority of them used hormonal FP, and out of them, 62 (78.8%) used combined pill.

It is evident from the table 2 that quarter of participants (68 participants, representing about 25%) lost their fetuses and the majority of them<sup>(58)</sup> lost it without a determinate cause.

Table (4) shows that more than forty percent of the participant teenage mothers had

**Table 3: Distribution of medical problems associated with pregnancy and delivery among the participants (n=205)**

Presence of medical problem	Frequency	Percent
Yes	73	41.4
No	103	59.6
<b>Types of medical problems</b>		
Post-partum haemorrhage	10	13.6
Infection	2	2.7
Post-partum depression	1	1.3
Gestational diabetes	19	26.0
Pregnancy-induced hypertension	13	17.8
Preterm labour	24	32.8
Congenital disease	2	2.7
Chromosomal disorder	2	2.7

**Table 4: Correlation between passive smoking and history of the abortions (n=205)**

		History of the abortions			Total
			yes	no	
Passive smoking	yes	count	43	45	88
		% of total	24.3	25.4	49.7
	no	count	25	64	89
		% of total	14.1	36.2	50.3
Total count		68	109	117	
% of total		38.4	61.6	100	

Significant correlation was found between passive smoking and history of the abortions

P- Value = 0.005

medical problems in pregnancy and delivery, and that the most common medical problem to be experienced by them was preterm labor (32.8% suffered from preterm labor).

## DISCUSSION

The present study revealed that the majority of the participants' ages ranged between 17-19 years, and that their most common level of education was primary school. This finding is similar to a result found by a study conducted by Vincent Gwido and Fekadu Mazengia Alemu in Juba, which revealed that the majority of the participants' ages were between 17 and 19 years<sup>(13)</sup>. Regarding marital age, two thirds of the study got married between the ages 14-16. This result is similar to a result by a study conducted in one of the rural districts in Amhara Region, where there was a high percentage of early marriage<sup>(13)</sup>. This similarity could be due to the presence of some related socio-demographic, cultural, school dropout and individual adolescent characteristics in the areas of study. Another result by the current study indicated that the majority of the participants were multiparous. This was supported by the study of Ahmed et al, where the majority of the respondents (representing 76%) were multiparous<sup>(14)</sup>.

In terms of employment, the current study found out that the majority of participants were unemployed (94.1%) compared to a study done in Abia State which found 75.8% of the respondents were unemployed<sup>(14)</sup>. This difference could be due to some social, cultural, individual characteristics and difference in the areas of study. Three-quarter of the participants became pregnant in the first year of marriage. This finding is consistent with that of a study conducted by D. R. Acharya, R. Bhattarai, and A. Poobalan in South Asia, which found that the majority of the participants got pregnant in the first year of marriage<sup>(13)</sup>. This might be because teenagers have high fertility<sup>(15)</sup>. Evidence showed that as the proportion of marriage increased, the probability of exposure to pregnancy also increased<sup>(13)</sup>. According to the results of the

present study, forced marriage was found among 40.5% of the teenage women enrolled in the sample. This high rate of forced marriage may be related to family choices, as nearly half of the participants' husband relationship was a first-degree relationship; these norms are found in most rural areas in Sudan where relatives – especially parents and guardians – often chose their girls' husbands.

Furthermore, the findings of the present study indicated that half of the participants had a regular menarche between 9-13 years, and that they got pregnant early, shortly after menarche. There is a strong statistically significant association between the age of marriage of the participants and the time of the first pregnancy ( $p$ -value = 0.00). Their menstrual cycle was dysmenorrhea and they did not take treatment. This might be due to the local culture which may envisage seeking treatment for dysmenorrhea as taboo, or perhaps because of limited access to the health facilities. Quarter of participants did not use family planning methods. This result is supported by other studies which found that the prevalence of teenage pregnancy increased among contraceptive nonusers<sup>(15)</sup>. When the proportion of contraceptive nonusers increased the proportion of pregnancy increased<sup>(14)</sup>.

The current study also showed that the majority of the participant teen mothers took family planning methods (combined pills) without medical advice, and this might be due to low the level of education among the participants and difficulty to access health facilities. Regarding medical problems after pregnancy and delivery, less than half of them had such problems. Studies have shown that teenage pregnancy has poor maternal and perinatal health<sup>(16)</sup>. Complications during pregnancy and childbirth are the second cause of death for 15-19-year-old girls globally. Every year, some 3 million girls aged 15 to 19 undergo unsafe abortions<sup>(16)</sup>. There is statistically significant association between passive smoking and abortion ( $p$ -value = 0.005). It was also found that many adolescent

mothers suffered pregnancy-induced hypertension<sup>(17,18)</sup>. Babies born to adolescent mothers face a substantially high risk of dying than those born to women aged 20 to 24<sup>(16)</sup>.

## CONCLUSION

Teenage pregnancy has attracted a great deal of concern and attention because it might be high-risk pregnancy condition that requires good skill in antenatal care for good outcome in both developed and developing countries. The factors contributing to teenage pregnancy are numerous; early – planned or unplanned – pregnancy was the most common of them, followed by low level education, and non-use of family planning methods.

## RECOMMENDATIONS

The researchers recommend providing health education and promoting health services and giving more attention to adolescent mothers, especially in rural areas.

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# Anxiety and Coping Strategies of Nursing Students during COVID-19 Pandemic in selected Nursing Campuses

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## ABSTRACT

Anxiety is highly prevalent among nursing students even in normal circumstances. The objective of this study was to assess levels of anxiety and ways of coping among nursing students on the selected campuses.

A cross-sectional study was conducted among 215 students of Bachelor level in two nursing campuses from October to December 2020. Anxiety levels were assessed using the Generalized Anxiety Disorder 7-Item Scale. The study found that the prevalence of mild, moderate, and severe anxiety was 45.6%, 25%, and 13% respectively. Age of the participants, Nursing Programme, and type of family were significantly associated ( $p < 0.05$ ) with the level of anxiety however, other socio-demographic factors were not found associated with anxiety level. Moderate and Severe level of anxiety was found significantly high among students below the age of 20 years, BSc. Nursing students and joint family respectively. The students' coping strategies were strictly using personal protective measures (94.9%), doing relaxation activities (81%), chatting with and getting support from family and friends (79.5%), and praying, worshipping, and engage in spiritual work by 42.3%. about one-third (28.4%) get help from doctors to reduce stress and 7% vent emotions by crying and screaming.

The majority of the nursing students had mild anxiety during the COVID-19 pandemic and majority of them used at least one coping strategy for the anxiety.

**Keywords:** Anxiety, Coping Strategy, Covid-19, Pandemic, Nursing students.

## INTRODUCTION

The world has been facing the COVID-19 pandemic since December 2019. Nursing students are in close contact with the patients in providing continuous care during their clinical placement. Today everyone is thankful to all corona warriors; especially nurses because they are working round the clock, isolating themselves from their families, placing them self at risk, to fight against this pandemic. We have seen exceptional overwork by nurses directly involved in the response to the COVID-19

pandemic. Nurses play a vital role in the healthcare system and medical team. Nurses are the front-line fighters against the COVID-19 pandemic, providing support and services to patients to prevent and control the outbreak.

During an epidemic/pandemic, national nursing students are bare to further stressful factors. In a study conducted in Saudi Arabia during the 2016 MERS outbreak, healthcare students stated their reluctance to work in healthcare facilities with insufficient MERS infection control isolation policies.<sup>(1)</sup>

Nursing education has been constantly associated with anxiety among students. Heavy course loads, stringent examinations, continued pressure to attain a high-grade point average, complex interpersonal relationships, challenges of the clinical environment, caring for chronic and terminally ill patients results in greater anxiety among nursing students than among students from any of the other healthcare disciplines. <sup>(2,3,4)</sup> Anxiety has a negative outcome on the quality of students' lives, their education, and clinical practice. <sup>(5)</sup>

Nursing students are the upcoming health care providers, their quality training and teaching will absolutely affect the outcomes. <sup>(6)</sup> This study utilized an online survey-based study with the objective of assessing the Anxiety and coping strategies for COVID-19 among nursing students.

## MATERIALS AND METHODS

**Study Design:** Descriptive cross-sectional research design was used to assess the anxiety and coping strategies of nursing students during the COVID-19 Pandemic.

**Settings /Subjects:** The study was conducted among bachelors' level nursing students studying at Maharajgunj nursing campus of Tribhuvan University and College of Medical and Allied Health Science of Purbanchal University. Non-probability, convenient sampling method was used to select the sample. Total 215 students were recruited from October to December 2022.

**Inclusion Criteria:** Only bachelor's level nursing students studying in Maharajgunj Nursing campus of Tribhuvan University and College of Medical and Allied Sciences of Purbanchal University who were interested to engage in the study with internet access and, who have completed the online survey were considered.

**Ethical Consideration:** Permission to undertake the research study was granted by Nepal health Research Council. The principle of human dignity and justice was maintained

and informed consent was obtained. Respondents' privacy was protected to the fullest extent possible. Participants were not obligated to participate and had the option to withdraw at any time. A brief introduction describing aims, processes, the voluntary nature of participation, and a pledge of confidentiality and anonymity appeared on the questionnaire's cover page.

**Data Collection Tool:** The set of Standard tools GAD-7 developed by Spitzer et al. 2006 was used to assess anxiety. <sup>(7)</sup> The Cornbrash's alpha value of the scale was 0.85 as mentions by Johnson et al. <sup>(8)</sup> The Generalized Anxiety Disorder-7 Scale (GAD-7) is composed of 7 items. They are 4-point Likert-type items. Scores from 0 to 4 indicate a minimal level of anxiety. Scores from 5 to 9 indicate a mild level of anxiety. Values between 10 and 14 indicate moderate anxiety, whereas scores between 15 and 21 indicate severe anxiety. To find out the coping technique, researchers designed questions based on literature review. It was an organized and self-administered online survey. The tool's content validity was maintained by engaging subject experts and conducting the literature study. The study instrument was pre-tested in 10% of the sample size, and no changes were required following pre-testing.

**Data Collection Procedure:** Students were determined using the convenience method who answered the online survey developed through Google forms with an appended consent form. The survey link was sent to the students via various social media. The participants could view the questions and answers by simply clicking on the link, which took about 15 to 20 minutes to complete.

**Data Analysis Procedure:** Collected data were entered in Statistical Package for Social Sciences (SPSS) version 16 for analysis. Data analysis was done by using descriptive and inferential statistics (chi-squares test and fisher's exact test were used for show the association between independent and dependent variables) and presented in table.

## RESULTS

Out of 215 nursing students (Table 1) mean age and standard deviation was  $23.42 \pm 3.534$  and ranged from 19 to 41 years. More than half were Bramin/Kshetri (64.7%) Similarly, about half (44.7%) reside in the municipality. Regarding the study programme, 51.6% were studying Bachelor in Nursing (BNS). Three fourth (75.3%) of the students were unmarried and 79% were living in a nuclear family. About half (44.7%) of the students' family members had been diagnosed with chronic illness and very few of the students (4.2%) had been diagnosed COVID-19 in the family.

On the COVID-19 (Table 2), over half of the students (44.2%) said they had been

nervous, anxious, or on edge for several days (Table 2). Not at all was given by 50.7 percent of participants as the reason for not being able to halt or manage worrying, followed by 33 percent many days and 8.4 percent virtually every day. 10.2 percent of respondents said they worried too much about different topics almost every day, and 26.5 percent said they had problems relaxing. For several days, one-third of the participants (34.9%) said they are easily angered or angry, and 36.7 percent said they are frightened that something bad may happen for several days.

While calculating overall score on Anxiety level (Table 3), 45.6% of participants had mild level of anxiety followed by Moderate

**Table 1: Socio-demographic characteristics of the nursing students (n=215)**

Characteristics	Number	Percentage
<b>Age (in completed years)</b>		
< 20	22	10.2
21-25	112	52.0
>25	81	37.7
<b>Mean age <math>\pm</math>S.D = 23.42 3.534</b>		
<b>Ethnicity</b>		64.7
Brahmin/Chhetri	139	17.7
Janajati	38	9.8
Newar	21	2.8
Dalit	6	5.1
Terai Madhesi	11	
<b>Programme</b>		51.6
BNS	111	48.4
BSc Nursing	104	
<b>Marital Status</b>		75.3
Unmarried	162	24.7
Married	53	
<b>Residence</b>		31.6
Metropolitan city	68	14.0
Sub Metropolitan City	30	44.7
Municipality	96	9.8
Rural Municipality	21	
<b>Type of Family</b>		79.1
Nuclear	170	20.9
Joint	45	
<b>Chronic illness In Family</b>		44.7
Yes	96	55.3
No	119	
<b>COVID-19 Infection in Family</b>		4.2
Yes	9	95.8
No	206	

**Table 2: Students' anxiety during COVID-19 pandemic(n=215)**

Statements (Within 2 Weeks)	Participants Responses			
	Not at all N (%)	Several days (%)	Over half the day's N (%)	Nearly every day N (%)
Feeling nervous, anxious, or on edge	83(38.6)	95(44.2)	19(8.8)	18(8.4)
Not being able to stop or control worrying	109(50.7)	71(33.0)	17(7.9)	18(8.4)
Worrying too much about different things	96(44.7)	81(37.7)	16(7.4)	22(10.2)
Trouble relaxing	129(60.0)	57(26.5)	16(7.4)	22(10.2)
Being so restless that it's hard to sit still	160(74.4)	34(15.8)	11(5.1)	10(4.7)
Becoming easily annoyed or irritable	107(49.8)	75(34.9)	18(8.4)	15(7.0)
Feeling afraid as if something awful might happen	95(44.2)	79(36.7)	21(9.8)	20 (9.3)

(25.0%) and severe (13%) level of anxiety, and the remaining 16.4% had a minimal level of anxiety.

Coping is broadly defined as the conscious or unconscious cognitive and behavioral strategies an individual employ to manage stress. When asked about students' coping strategy during COVID-19 (Table 4), 94.9 percent said they used strict personal protective measures, followed by avoid going

**Table 3: Anxiety level of the students (n=215)**

Anxiety Level	Number	percentage
Minimal (Score 0 to 4)	35	16.3
Mild (score 5 to 9)	98	45.6
Moderate (score 10 to 14)	54	25.1
Severe (score 15 to 21)	28	13.0

outside (92.6 %), reading about COVID-19, its prevention and mechanism of transmission, while very few portion (7%) vent emotion

**Table 4: Coping Strategy Adopted by the students (n=215)**

Coping Strategies	Number	Percentage
Follow strict personal protective measures (e.g., mask, hand washing, etc.)	204	94.9
Avoiding going out in public places to minimize exposure from COVID-19	199	92.6
Reading about COVID-19, its prevention and mechanism of transmission	181	84.2
Do relaxation activities, for example, involved in meditation, sports, exercise, music, etc.	175	81.4
Chat with family and friends to relieve stress and obtain support	11	79.5
Use social media and social networks such as Facebook, Twitter, tiktok, YouTube, etc.	161	74.9
Try to be busy at home in activities that would keep my mind away from COVID-19	161	74.9
Talk and motivate myself to face the COVID-19 outbreak with a positive attitude	142	66.0
Praying, worshipping and engage in spiritual work.	91	42.3
Play online games and computer games	68	31.6
Get help from family physicians or other doctors to reduce stress and get reassurance	61	28.4
Avoid media news about COVID-19 and related fatalities	55	25.6
Vent emotions by crying, screaming, etc.	15	7.0

by crying, screaming etc. followed by avoid media news about COVID-19 (25.6%) and related fatalities as well as get help from family physicians or other doctors to reduce stress and get reassurance (28.4%).

The study found that the students' anxiety level was significantly associated with age of the students ( $p=0.002$ ), Nursing Programme ( $p=0.011$ ) and type of family ( $p=0.004$ ). However, other socio demographic factors were not found associated with anxiety (Table 5).

## DISCUSSION

In nursing, the topic of stress has gotten more attention which is evident in various literatures.

The prevalence of minimal, mild, moderate, and severe anxiety during COVID-19 among nursing students was found to be 16.3%, 45%, 25%, and 13% respectively in this study. This finding varies from the study conducted in Ashkelon Academic College; Southern District, Israel which presented the prevalence of moderate and severe anxiety as 43% and 13% respectively.<sup>(9)</sup> Such a variation in the level of anxiety may be due to the timing of the study. The current study was conducted after ten months of the emergence of the pandemic however the study conducted in Israel was during the third week of lockdown. According to previous studies, even in normal

**Table 5: Association between students' anxiety level and Selected Variables (n= 215)**

Variables	Level of anxiety				$\chi^2$ Value	P-value
	Minimal No.(%)	Mild No.(%)	Moderate No.(%)	Severe No.(%)		
<b>Age (in complete years)</b>						
< 20	4(18.2)	4(18.2)	8(36.4)	6(27.3)	19.450	.002*€
21-25	13(11.6)	52(46.4)	35(31.3)	12(10.7)		
>25	18(22.2)	42(51.9)	11(13.6)	10(12.3)		
<b>Marital Status</b>						
Married	9(17.0)	29(54.7)	9(17.0)	6(11.3)	3.319	.345
Unmarried	26(16.0)	69(42.6)	45(27.8)	22(13.6)		
<b>Nursing Programme</b>						
BNS(bachelor in Nursing)	23(20.7)	57(51.4)	19(17.1)	12(10.8)	11.165	.011*
BSC nursing	12(11.5)	41(39.4)	35(33.7)	16(15.4)		
<b>University</b>						
Tribhuvan University	27(17.0)	73(45.9)	40(25.2)	19(11.9)	.740	.864
Purbanchal University	8(14.3)	25(44.6)	14(25.0)	9(16.1)		
<b>Type of Family</b>						
Nuclear	32(18.8)	79(46.5)	44(25.9)	15(8.8)	12.919	.004*€
Joint	3(6.7)	19(42.2)	10(22.2)	3(28.9)		
<b>Chronic illness in family</b>						
Yes	14(14.6)	46(47.9)	24(25.0)	12(12.5)	.551	.907
No	21(17.6)	52(43.7)	30(25.2)	16(13.4)		
<b>Place of Residence</b>						
Metropolitan city	13(19.1)	31(45.6)	15(22.1)	9(13.2)	4.745	.577
Sub metro Politian City	4(13.3)	13(43.3)	6(20.0)	7(23.3)		
Municipality and rural municipality	18(15.4)	54(46.2)	33(28.2)	12(10.3)		
<b>COVID-19 infection in family</b>						
yes	1(11.1)	5(55.6)	1(11.1)	2(22.2)	1.747	
No	34(16.50)	93(45.1)	53(25.7)	26(12.6)		

Level of significance at <0.05,

$\chi^2$ chi square test,

€ fisher's' exact test



conditions, students experience anxiety. In Hong Kong, 12.2% of university and college students had moderate anxiety and 5.8% had severe anxiety; in Portugal, 15.6 percent had moderate anxiety and 8.3 percent had severe anxiety; and in Australia, 17.5 percent had moderate anxiety and 8.3 percent had severe anxiety.<sup>(10, 11, 12)</sup> The prevalence of moderate anxiety among medical students was 25% in the UK, 20% in North America, 13.7 percent in New Zealand, and 23% in Lebanon.<sup>(13)</sup> Likewise, the study conducted in College of Medical Applied Sciences Mohali Asser-King Khalid University showed that there is a prevalence of mild and moderate anxiety which is consistent with the findings of this study.<sup>(14)</sup>

In this study, participants were asked for their coping strategy during the COVID-19 pandemic, among all respondents; 94.9% mentions that they were followed strict personal protective measures followed by avoiding going outside (92.6%), doing relaxation activities (81.4%), chatting with family and friends and obtain support (79.5%), Use social media (74.9%), Try to motivate self with a positive attitude (66.0%), prying, worshipping and engage in spiritual work (42.3%), and get help from doctors to reduce stress (28.4%) while 7% vent emotion by crying and screaming. The findings of the study in Turkey which showed that the least commonly used coping strategy was exercising (38.6%) and the most commonly used anxiety coping strategy was spending time on the internet (77.8%).<sup>(15)</sup> Qualitative and quantitative studies have found that the reasons for increased internet usage were: More online conversations with family and friends because of social isolation, boredom, increased homework because of distance learning and trying to get more information about COVID-19.<sup>(16,17)</sup>

## CONCLUSIONS

Anxiety was present in most of the nursing students during COVID19. The anxiety of nursing students during the COVID-19

pandemic was found at a mild level in nearly half of the students; however, some students stated severe anxiety. The most strategies that were used to cope with anxiety were using protective measures, following relaxation techniques, and getting support from family and friends as well as involvement in religious work. Anxiety can affect the health of nursing students so recognizing the needs of the students during COVID-19 and developing interventions to lessen the possible anxiety and adopt adaptive coping strategies will be helpful to reduce mental health problems accompanying with the pandemic.

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# Stress among Undergraduate Nursing Students at Governmental Nursing Faculties in Sudan

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## ABSTRACT

**Introduction:** Stress among undergraduate nursing students is an increasingly important issue. Maladaptive responses can lead to serious health problems, such as anxiety, depression, and other mental health disorders. The aim of this study was to assess stress among undergraduate nursing students.

**Methods:** This study was a descriptive cross-sectional institution-based design with a sample size of 285 undergraduate nursing students from Omdurman Islamic University and Al Neelain University. The Perceived Stress Scale (PSS) was used to collect data.

**Results:** The majority of students (29%) reported environment as the leading cause of stress and had moderate level of stress. Second- and Fourth-year students had higher stress level compared to the First- and Third-year students.

**Conclusion:** This study concluded that environment-related pressures were the major cause of stress among undergraduate nursing students. It is recommended that academic counseling be established and maintained, and an orientation program provided to reduce stress. Tele learning and E-learning should also be initiated and maintained to reduce environmental stress.

**Keywords:** stress; undergraduate; nursing students; academic counseling; Sudan.

## INTRODUCTION

Stress is an inevitable part of life and affects people in different ways. It is a normal response to challenging situations that can be beneficial or harmful to an<sup>1</sup>. For undergraduate nursing students, stress can have a significant impact on their academic performance, mental health, and physical health<sup>2</sup>. It is important to understand the sources of stress among nursing students, the effects of stress on their academic performance, and the strategies for coping with stress.

Studies have identified several sources of stress among undergraduate nursing students. These include academic demands such as studying for exams and engaging in class discussions, as well as managing clinical placements and personal<sup>3</sup>. Furthermore, due to the increasing responsibilities of their profession, nursing students experience additional stressors such as the pressure to provide competent care, maintain a good grade point average, and meet the standards of their clinical placements<sup>4</sup>.

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The effects of stress on nursing students' academic performance can be significant. Studies have shown that students who experience higher levels of stress have worse academic performance than those who experience lower levels of stress<sup>5, 6</sup>. Furthermore, students who experience high levels of stress are more likely to experience physical and mental health issues such as headaches, depression, and anxiety<sup>7</sup>.

In order to cope with stress, nursing students must implement effective strategies. These can include developing good time management skills, engaging in positive self-talk, and engaging in physical activities such as yoga or meditation<sup>8</sup>. Furthermore, it is important for nursing students to reach out to peers and mentors for support, establish healthy boundaries between work and personal life, and maintain a balanced lifestyle<sup>9</sup>.

In conclusion, it is important to understand the sources of stress among undergraduate nursing students, the effects of stress on their academic performance, and the strategies for coping with stress. By understanding the sources of stress and taking proactive steps to manage it, nursing students can be better equipped to succeed in their academic and professional goals<sup>10-12</sup>.

The aim of this study was to assess stress among undergraduate nursing students at governmental universities in Sudan.

## METHODS

This cross-sectional, descriptive study was conducted at two governmental Faculties of Nursing, Alneelain University and Omdurman Islamic University, in Sudan. The study participants were 286 B.Sc. nursing students from all four levels (1-4) including repeat and upgrade students. Stratified sampling was used to select the study sample.

A self-administered structured questionnaire was used to collect data from the sample. The questionnaire contained three sections: (1) demographic profile (age, gender, university, academic year, nationality, residence, hours

spent studying per day, and hours of sleep per night); (2) Perceived Stress Scale (PSS) (American Institute of Stress, 2019; Cohen, 2019) to measure the level of stress; and (3) causes of stress domains (e.g., completion of extracurricular activities, performance of practical activities, professional communication, professional training, time management, environment, and theoretical activity).

Data were entered, coded, and analyzed using univariate and bivariate analysis in SPSS (Statistical Package for Social Sciences) Version 25. Frequency analysis, cross-tabulation, and manual revision were used to detect any errors. The results were presented in frequency tables, figures, and cross-tabulation. The significance test was carried out using the Chi-Square test, with a significance level of 0.05.

Prior to the start of the study, ethical approval was obtained from the Ethical Committee of the Institutional Review Board (IRB) at Alneelain University. Permission was also obtained from the Deans of the Faculties of Nursing Sciences at both Alneelain University and Omdurman Islamic University. Verbal consent was obtained from the students. All participants were ensured anonymity, confidentiality, and their privacy and dignity were protected. Participants had the right to refuse to answer any question.

In conclusion, this study utilized a descriptive cross-sectional institutional-based design to assess the level of stress and its causes among B.Sc. nursing students at two governmental Faculties of Nursing in Sudan. Stratified sampling technique was used to select the study sample, and a self-administered structured questionnaire was used to collect data. Data were analyzed using univariate and bivariate analysis, and the results were presented in frequency tables, figures, and cross-tabulation. The significance test was carried out using the Chi-Square test, with a significance level of 0.05. All participants were ensured anonymity, confidentiality, and their privacy and dignity were protected.



## RESULTS

**Table 1** provides demographic information on 285 participants in a study. The majority of the participants were female (95.8%) and were between the ages of 16 and 21 (53.7%). The highest percentage of participants (26.0%) were in either academic level 3 or 4, while the lowest percentage (4.2%) were male. Over half of the participants (56.1%) lived with their family, while a smaller percentage lived with classmates (27.7%) or relatives (16.1%).

The results show that the most common level of stress across all causes was medium, with the exception of theoretical activity where low stress was reported more frequently. A notable finding is that completion of extracurricular activities and professional

**Table 1: Demographic Profile of Participants in the Study**

Demographic Information	Percentage of Total Participants	Number of Participants
<b>Academic Level</b>		
Level 1	23.5%	67
Level 2	24.6%	70
Level 3	26.0%	74
Level 4	26.0%	74
Total	100.0%	285
<b>Gender</b>		
Male	4.2%	12
Female	95.8%	273
Total	100.0%	285
<b>Age Group</b>		
16-21 years	53.7%	153
22-26 years	41.4%	118
27-31 years	3.5%	10
32-36 years	1.4%	4
Total	100.0%	285
<b>Residence</b>		
With family	56.1%	160
With classmates	27.7%	79
With relatives	16.1%	46
Total	100.0%	285

training had the most significant proportion of participants reporting medium stress levels. On the other hand, time management and environment were identified as the causes with the highest level of stress, with a significant proportion of participants reporting high or very high stress levels as shown in **Table 2**.

**Table 3** presents the results of a study examining the relationship between academic year and stress levels among students. The study considered four academic levels, with level one being the first year and level four being the final year. The stress levels were measured based on three categories: low stress, moderate stress, and high stress.

The results show that the majority of students across all academic levels reported moderate stress levels. The highest number of students reporting low stress levels was in the first academic year, while the highest number of students reporting high stress levels was in the final academic year. It should be noted that the p-value of the study was 0.3, which suggests that the relationship between academic year and stress levels may not be statistically significant.

## DISCUSSION

In this study, we aimed to determine the level of stress among undergraduate nursing students in Omdurman Islamic University and Alneelain University in Sudan. Our results showed that the majority of the participants (95.8%) were female, and most of them (53.7%) were between the ages of 16-21 years. The majority (82.1%) of the participants reported moderate levels of stress.

In terms of academic year, our results revealed that first-year students had a lower level of stress compared to second and fourth-year students. This finding is consistent with previous studies that reported moderate stress levels among undergraduate students<sup>13, 14</sup>. However, the increased stress levels among second and fourth-year students may be due to the increased demands of their academic and personal lives<sup>15</sup>.



**Table 2: Level of Stress Experienced by Participants According to Different Causes**

Cause of Stress	Very Low Stress	Low Stress	Medium Stress	High Stress	Very High Stress	Total Participants
Completion of Extracurricular Activities	16.5% (47)	23.5% (67)	35.4% (101)	17.2% (49)	7.4% (21)	100% (285)
Performance of Practical Activities	14% (40)	25.6% (73)	27.7% (79)	24.2% (69)	8.4% (24)	100% (285)
Professional Communication	15.8% (45)	21.8% (62)	40% (114)	16.8% (48)	5.6% (16)	100% (285)
Professional Training	16.5% (47)	26% (74)	29.8% (85)	18.9% (54)	8.8% (25)	100% (285)
Time Management	13.3% (38)	18.9% (54)	24.2% (69)	20% (57)	23.5% (67)	100% (285)
Environment	16.1% (46)	16.5% (47)	18.6% (53)	20% (57)	28.8% (82)	100% (285)
Theoretical Activity	11.6% (33)	25.6% (73)	31.9% (91)	16.8% (48)	14% (40)	100% (285)

**Table 3: Stress Level by Academic Year**

Academic Year	Low	Moderate	High
Level one	0	58	9
Level two	2	55	13
Level three	4	61	9
Level four	1	60	13
Total	7	234	44

Our study also found that the faculty environment was a significant source of stress among nursing students. This is supported by previous research that evaluated stress factors among nursing students in Malaysian Public Universities<sup>16, 17</sup>. The majority of the participants reported moderate levels of stress in relation to academic activities, such as completion of extracurricular activities, performance of practical activities, professional communication, professional training, time management, and theoretical activities. These results suggest that academic stress among nursing students is reasonable and moderate<sup>13</sup>.

Additionally, our study found that factors such as universities, academic year, nationality, residence, and age were not significantly associated with stress levels among nursing students. This finding is

consistent with previous studies that assessed stress levels among undergraduate medical students and nursing students in Malaysian Public Universities<sup>18-20</sup>.

## CONCLUSION

In conclusion, this study highlights the importance of addressing stress among undergraduate nursing students and the potential role of the educational institution in providing support. Future research could further explore stress-management strategies to help nursing students manage their stress levels. We would like to thank all of the students who participated in this project and their universities.

**Conflict of Interest:** The authors declare that they have no financial or non-financial interests that could potentially impact the results or interpretation of the study.

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**Ethical Clearance:** Ethical approval was obtained from the Institutional Review Board (IRB) at Alneelain University. The study was in accordance with the ethical standards and guidelines set by the IRB.

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# Effect of Training Program on Nurses' Knowledge Towards Care of Patients with Myocardial Infarction in General Najran Hospital, Najran City, KSA

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## ABSTRACT

**Background:** The most common cause of myocardial infarction is the occlusion of the coronary artery. Education and training in the nurses providing care for myocardial infarction patients lead to a decrease in patient morbidity and mortality. The aim is to determine the effect of training programs on nurses' knowledge toward the care of patients with myocardial infarction.

**Methods:** The study was conducted in the cardiac care unit at General Najran hospital, Najran city. A quasi-experimental design was used from August 2019 to April 2020 on 30 nurses. A questionnaire was used to collect data about nurses' knowledge toward myocardial infarction. According to the detected need of nurses develop a training program and implemented it through the session to update nurses' knowledge.

**Results:** The results revealed a statistically significant difference in nurses' knowledge related to care of myocardial infarction pre- post-training program. There was a significant relationship between nurses' knowledge and their demographic characteristics pre-post program.

**Conclusion:** A statistically significant difference in nurses' knowledge of pre and post-training programs was found. Pre and in-service training programs should be implemented for all nurses working in ICU to update their knowledge about myocardial infarction patient care.

**Keywords:** Myocardial infarction, Nurses knowledge, Training Program, Najran City

## INTRODUCTION

The mortality rate caused by Myocardial Infarction (MI) is still high for both sexes, according to the world health organization's estimation, it was 5674 deaths each year (WHO, 2002). The most common cause of myocardial infarction is occlusion of the coronary artery, usually precipitated by rupture of vulnerable atherosclerotic plaque and subsequent thrombus formation<sup>1</sup>. After an acute myocardial infarction, the patient is discharged within a few days, often in a state of anxiety and great uncertainty. The spouse is usually even more anxious than the patient and often finds the immediate post-discharge period extremely stressful.

Most patients, but few partners, will have received some instruction from the Coronary Care Unit (CCU)nurses about the nature and treatment of the attack,but unless there are formal educational sessions,the amount learned is unpredictable<sup>2</sup>.

The most effective way to increase the probability that the patient will comply with a self-care regimen after discharge is to provide adequate education about the disease process and to facilitate the patient's involvement in MI rehabilitation program.Working with patients in development plans to meet their specific needs. To extend and improve the quality of life, a patient who has had MI must learn to regulate activity according to personal

responses to each situation. The nurse and patient develop a program to help the patient achieve desired outcomes<sup>3</sup>. Avoiding any activity that produces chest pain, dyspnea, or undue fatigue, avoiding extremes of heat and cold and walking against the wind, losing weight, stopping smoking, alternating activity with rest periods, using personal strengths to compensate for limitations, developing regular eating patterns, adhering to medical regimen, pursuing activities that release tension and controlling of the co-morbid conditions<sup>4</sup>.

Intensive care requires a high-level qualification and competencies. Therefore, there has been a need to examine and describe competence guidelines, standards, and frameworks of critical care nursing<sup>5</sup>. The nurse's role in myocardial infarction care includes chest discomfort relieving, reducing anxiety, assessing vital signs, and documenting the mental status and level of anxiety<sup>6</sup>. Improving Respiratory Function and Monitoring and managing potential complications<sup>7</sup>.

## AIM OF THE STUDY

This study aimed to assess the effect of the training program on nurses' knowledge toward the care of the patient with Myocardial Infarction.

## SUBJECTS AND METHODS

The study was carried out in an intensive care unit in General Najran Hospital, Najran city, KSA. A quasi-experimental design was used to study the effect of the training program on nurses' knowledge toward the care of patients with MI in General Najran Hospital, Najran City, KSA. 30 nurses working in the intensive care unit were selected by simple random sampling. Data were collected by the use of the questionnaire. The questionnaire included 4 parts: 1) Nurses' demographic characteristics, which includes 4 questions covering: age, qualification, marital status, and monthly income, 2) anatomy of the cardiovascular system includes 6 questions

covering the: site of the heart, weight of heart, chambers of the heart, a wall of the ventricle, cardiac output and stroke volume, 3). Physiology of the cardiovascular system includes 4 questions covering the: consist of the cardiovascular system, sinus of the heart, layers of the heart, and important blood vessels a) Coronary artery disease, includes 24 questions covering the: causes of coronary artery disease, theories and risk factors of atherogenesis, pain and precipitating factors of angina, risk factors of atherosclerosis and MI, chest pain, clinical manifestation, complications, diagnostic tests, pharmacological management of MI, nursing role, nursing diagnosis, nursing intervention for the patient with MI.

The training program was applied for improving nurses' knowledge related to the care of the patient with Myocardial Infarction. The content validity was established by a panel of 5 experts who reviewed the tool for clarity, relevance, comprehensiveness, understanding, applicability, and ease of implementation and according to their opinion, minor modifications were applied. A pilot study was carried out on five nurses (16.7%) in the intensive care unit to test the clarity and practicability of the tools. The results of the data obtained from the pilot study helped in the modification of the tool, the item was then corrected as needed.

Data collection was carried out from August 2019 to April 2020 in the morning and afternoon shifts, the questionnaire sheet was filled out by the nurses, while they were in the workplace. The data was collected pre and post-training program. Upon completion of data collection, variables included in each data collection sheet were organized and tabulated, and coded prior to computerized data entry by using SPSS, version 21. Data were summarized by using mean  $\pm$ SD as an average describing the central tendency of data. Used the paired t-test for the quantitative variable and the McNemar test for the qualitative variable. Statistical significance was considered at  $P$ -value  $< 0.05$ .

For the nurse knowledge score, a score of one was awarded for the correct answer and zero for an incorrect answer. The mean and standard deviation of the total knowledge score was calculated. The nascore of 60% or more was categorized as satisfactory and a score less than 60% as unsatisfactory.

The official permission to conduct the study was taken from the faculty of Nursing, at Najran University. Permission for data collection and implementation of the training program was obtained from the Manager of General Najran hospital and the head of nursing in the intensive care unit (ICU). The purpose of the study was explained prior to questionnaire distribution. At the initial

interview, the researcher informed each nurse about the nature, purpose, and benefits of the study, and was informed that her participation is voluntary. The confidentiality and anonymity of the subjects were also assured through the coding of all data. The researcher was assured that the data collected and information was confidential and would be used only for the purpose of the study.

## RESULTS

Table 1 documents that there are highly statistically significant differences among the study nurses in all items of knowledge in pre and post-program ( $P < 0.0001$ ). Table 3 shows the nurse's level of knowledge about

**Table 1: The nurse's means core of their knowledge about the care of the patient with myocardial infarction pre and post-program (n=30)**

Items	Pre-training program		Post-training program		t-test	P-value
	$\bar{X}$	$\pm$ SD	$\bar{X}$	$\pm$ SD		
Anatomy of the Cardiovascular system	41.33	18.14	89.66	14.19	12.89	0.000**
Causes, theories, and risk factors of Coronary Artery Disease	53.88	30.85	78.33	17.58	3.32	0.002**
Information about Myocardial Infarction	57.14	21.55	75.71	17.65	3.43	0.002**
Nursing care for patients with Myocardial Infarction	48.78	20.18	87.87	11.02	8.50	0.000**

\*\*Statistically significant

**Table 2: The nurse's level of knowledge about the care of the patient with myocardial infarction pre and post-program (n= 30)**

Items	Pre-training program				Post-training program				P-value*
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		
	F	%	F	%	F	%	F	%	
Anatomy of Cardiovascular system	14	46.7	16	53.3	29	96.7	1	3.3	0.000**
Causes, theories and risk factor of Coronary Artery Disease	18	60	12	40	30	100	0	0	Can be not calculated
Information about Myocardial Infarction	18	60%	12	40	27	90	3	10	0.022**
Nursing care for patient with Myocardial Infarction	13	43.3	17	56.7	30	100	0	0	Can be not calculated

\*McNemartest

□\*statistically significant



**Table 3: The relation between mean score of nurses knowledge and their age pre and post-program (n=30)**

Nurses knowledge	Age range				t-test	P-value
	18-30 year		>30 year			
	$\bar{X}$	$\pm SD$	$\bar{X}$	$\pm SD$		
Pre training program	52.27	13.19	51.36	17.86	0.158	0.876
Post training program	83.63	9.96	95.09	8.78	4.64	0.011**

\*\*Statistically significant

**Table 4: Relation between mean score of nurses knowledge and their marital status pre and post-program (n=30)**

Nurses knowledge	Marital status				t-test	P-value
	Unmarried		Married			
	$\bar{X}$	$\pm SD$	$\bar{X}$	$\pm SD$		
Pre training program	49.1	17.01	53.40	13.48	0.758	0.455
Post training program	85.2	7.59	85.56	10.53	0.100	0.921

**Table 5: Relation between mean score of nurses knowledge and their qualification pre and post-program (n=30)**

Nurse's knowledge	Qualification				t-test	P-value
	Bachelor		Secondary education			
	$\bar{X}$	$\pm SD$	$\bar{X}$	$\pm SD$		
Pre training program	52.27	16.15	51.90	14.63	0.050	0.961
Post training program	88.18	8.09	84.90	9.83	0.795	0.454

the cardiovascular system and myocardial infarction pre-post program. According to the table, the nurse's level of knowledge was unsatisfactory in the pre-test results. At the post-test, nearly all nurses had asatisfactory level of knowledge about all items of the cardiovascular system and myocardial infarction. The difference in satisfactory nurse knowledge pre and post-program was statistically significant ( $P < 0.001$ ).

Table 4 clarifies that highly statistically significant differences were found in relation to knowledge after the program and in the nurse's age group ( $p < 0.01$ ). Table 5 shows that there is no statistically significant differences were found between nurses' marital status and their score of knowledge pre and post-program ( $P > 0.05$ ). Table 6 Indicates that no statistically significant differences between nurse's qualification and their knowledge of pre and post-training programs.

## DISCUSSION

Regarding the general characteristics of the study subjects, the results of this study clarify that more than two-thirds of the studied subjects were married, aged between 18-30 years and more than three-quarters had a secondary diploma in nursing. This result is in agreement with the study conducted by Shalby (2009)<sup>8</sup>, who reported that the mean age of nurses who graduated from the secondary school of nursing ranged between 22-24 years and most of them are single. Also, the present study agrees with Said (2006)<sup>9</sup>, who emphasized in her study at Benha University that lack of nurses' education is considered a failure in the system leading to unsatisfactory healthcare and that the majority of nurses didn't attend any training programs for patient care with myocardial infarction, thus there was bad knowledge and care introduced to patients. This may be due to a lack of service

in educational programs. This study disagrees with Chun-Hua et al (2008)<sup>10</sup>, who reported that the mean educational level in their study in China was bachelor above (34.1%), while the current study results revealed the main studied nurses' qualification was a secondary nursing diploma.

Regarding nurses' knowledge, the result of the present study clarifies that more than three-quarters of the studied subjects improved their knowledge scores in all items of myocardial infarction patient care after the implementation of the program. This result agrees with Maysoon et al (2011)<sup>11</sup>, who showed that the Jordan nurses improved their knowledge and attitudes after the implementation of the program. It also agrees with Heather et al (2011)<sup>12</sup>, who said that Nurses showed significant improvement in knowledge ( $p = 0.02$ ) and self-efficacy ( $p = 0.001$ ) from baseline to post-training. It is also similar to that of Shalby (2009)<sup>8</sup> who found in his study an improvement in the nurse's knowledge scores after the program with highly statistically significant differences. This finding agrees with Taha (2006)<sup>13</sup> who found that the knowledge scores after implementation of the program are highly statistically significant differences. This is inline with Paez et al (2003)<sup>14</sup> who showed achievement of teaching objects in their study on the assessment of the educational program. There might be nurses exposed to an educational program to update their knowledge about the care of the patient with myocardial infarction.

Concerning the relation between the nurses' age and their mean score level of knowledge about the myocardial infarction patient care pre-post training program. The present study revealed a high statistical relation between the nurses' age and their level of knowledge pre-post-program ( $P = .011$ ). It shows that the nurses, aged between 30 years and above, had a high mean score of knowledge than the nurses belonging to the age group of eighteen to thirty. There might be nurses of the same age concentrate on their

careers so they are interested in improving and updating their knowledge to get better opportunities for promotion. The younger nurses, on the other hand, are not interested in updating their knowledge because they had already fresh knowledge because most of them are new graduates. These results were in agreement with Shalby (2009)<sup>8</sup> who shows that there is a statistically significant difference between nurses' knowledge, practice, and empowerment after post scores. Also, the study conducted by Taha (2006)<sup>13</sup> documents a positive correlation between age and knowledge and practice. This result also agrees with Abd-Elmoniem (2001)<sup>15</sup> who found that there was a positive correlation between knowledge and nurses' age in the post-test.

As for the relationship between the nurse's marital status and their total score of mean knowledge pre and post-program, the study finding revealed no relation between nurses' marital status and their mean score of knowledge in pre-post-program. This finding was in line with the study conducted by Shalby (2009)<sup>8</sup>, at Benha University hospital, who reported no significant relationship between nurses' knowledge pre and post-program and their marital status. Also, the present study finding is supported by a study by Janice et al (2005)<sup>16</sup> who found no statistically significant difference between the study subjects' knowledge and their marital status before and after the program. But the present study finding was contradicted by Heather et al (2011)<sup>12</sup> who reported a positive relationship between the study practice of knowledge and their marital status after the post-implementation of the program. Also, the same finding was mentioned by Adeline et al (2008)<sup>17</sup>, who showed a positive correlation between the nurses' knowledge and their marital status throughout the program of health education.

The present study's finding revealed no relationship between the nurses' level of the mean score of knowledge and their qualification in pre-post-program. There

might be nurses who worked in the cardiac care unit who had a diploma in nursing and fewer of them had a bachelor's degree. The same finding was reported by Bangalore and Karnataka (2005)<sup>18</sup> who concluded that the qualification did not affect the knowledge and practice of the studied sample. However, this result disagrees with Shalby (2009)<sup>8</sup> who reported that previous qualifications were positively correlated with the knowledge scores of nurses. It also disagrees with Weber (2007)<sup>19</sup> who documented that there is a positive relationship between knowledge and qualification of the studied subjects and their knowledge throughout the program.

## CONCLUSION

Based on the finding of the present study it can be concluded that: There are highly statistically significant differences in the mean score of nurses' knowledge pre and post-training programs. Nurses' Knowledge of care for patients with myocardial infarction improved significantly after program implementation.

## RECOMMENDATION

Continuous in-service training programs for all nurses working in ICU to update their knowledge.

**Conflict of interest:** (Nil) no found conflict

**Source of Funding:** Myself

**Ethical clearance-** Taken from Scientific Research Ethical Committee; attachment by file name (approval of research committee for MI Najran)

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# Sleep Quality and Depression among women with Abnormal Uterine Bleeding (AUB)

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## ABSTRACT

**Background:** Abnormal Uterine Bleeding (AUB) is defined as an irregularity in menstrual bleeding. Sleeping difficulty and depressive disorders were typically noticed in patient with AUB.

**Methods:** A explorative research design was conducted among AUB women. One hundred fifty (n=150) women were purposively selected from Gynaecology OPD of IMS & SUM Hospital, Bhubaneswar, Odisha. The tools i.e. (1) Demographic questionnaire to assess the demographic characteristics, Questionnaire to assess the contributing factors of AUB, PSQI scale to assess sleep quality and Beck Depression Inventory scale was used to assess depression. The data were analysed using descriptive and inferential statistics with SPSS 21 version.

**Results :** Majority of women (46.66%) were between the age group of 46 and 50. Highest mean score seen in sleep duration domain i.e.  $2.32 \pm 0.78$  and lowest score seen in sleep medication domain i.e.  $0.30 \pm 0.61$ . Score interpretation shows that the person score  $\geq 5$  indicate poor sleep quality. Highest percentage (39.33%) of women had severe depression according to score, followed by 29.33% had moderate depression and 11.33% had extreme depression whereas 8.66% and 6.66% had mild, borderline depression respectively whereas, only less than 5% (4.66%) were normal. Hence it can be interpreted that most of the women had poor sleep quality and depressed due to AUB.

**Conclusion:** The result of this study concluded that there is need to screen and plan appropriate mental health management for women with AUB to improve the sleep and reduce the magnitude of depression.

**Keywords:** Women, Abnormal uterine bleeding, contributing factors, Sleep quality and depression.

## INTRODUCTION

Abnormal Uterine Bleeding (AUB) is any bleeding that differs from normal menstruation. In AUB the frequency, length and pattern of bleeding throughout a menstruation cycle may vary.<sup>1</sup> Any variation from the regular menstrual flow is referred to as the AUB. Menstrual bleeding patterns that are irregular, periods that last longer than seven days, menorrhagia, and excessive amounts (more than 80 ml per period) are all considered abnormal bleeding.<sup>2</sup>

AUB is a symptom that can result from a variety of conditions including malignancy, hormone

imbalance, structural lesions and physiological processes in different age groups. To standardise terminology, diagnoses and investigations in women presenting with AUB, the FIGO categorization system (PALM-COEIN) was developed in 2011.<sup>3</sup>

The International Federation of Gynaecology and Obstetrics (FIGO) had classified the causes of AUB according to (PALM-COEIN). There are mainly 9 classification which are arranged according to acronym PALM-COEIN: P-polyp, A - adenomyosis, L-liomyoma, M- malignancy and hyperplasia, C-coagulopathy, O-ovulatory

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dysfunction, E- endometrial, I -iatrogenic, N- not yet classified. AUB impact quality of life of women. It results poor productiveness and social relationship<sup>4</sup>

AUB is a widespread condition that affects women of all ages and has an adverse effect on their physical, mental and social wellbeing. Correct clinical diagnosis and the determination of the causal cause are crucial.<sup>5</sup> It estimates the prevalence of menstrual problems, such as heavy menstrual bleeding (HMB), intermenstrual bleeding, abnormal menstrual cycle and premenstrual symptoms changes from 19-35%<sup>6-8</sup>. Menstrual problems are common among premenopausal women, especially just before and during menopause. AUB can interfere with quality of life and lead women to seek medical care<sup>9-11</sup>.

The incidence of AUB ranges about 22.02%, 44% of women in the age group of 31-40 are mostly affected by AUB. Multiparous women was at higher risk of developing AUB. The most common aetiology was found to be leiomyoma (47%). The most (70%) common complaint was heavy menstrual bleeding and most common diagnostic procedures done were USG abdomen, thyroid profile test and biopsy. Majority of women's developed anaemia due to heavy menstrual bleeding.<sup>10</sup> Nearly half of the patients (46%) are with stress, which shows stress is one of the contributing factors of AUB and vice versa.<sup>12</sup>

Menstrual problem is associated with Sleep disturbance. Prevalence rate of irregular menstrual cycle, heavy menstrual bleeding, menstrual flow length more than 7 days significantly higher in participant with sleep disturbance. Heavy menstrual bleeding has significant association with Poor sleep quality and insomnia symptoms were significantly associated with menstrual length  $\geq 7$ <sup>13</sup>.

Anxiety and depression frequently observed in women with AUB. It has been observed that from various study the women with AUB experienced the most common psychological symptoms such as depression and anxiety. AUB also associated with more negative course and more negative

outcome.<sup>14</sup> Women with AUB (15.6%) had major depression, 18.8% of women had generalized anxiety disorder and 22.9% interfere with the quality of life and mood problems such as anxiety and depression also associated with abnormal uterine bleeding and AUB associated with more negative impact anxiety - depression comorbidity.<sup>15</sup>

## METHODS AND MATERIALS:

A Quantitative approach with an explorative research design was conducted to assess the Sleep quality and depression among women with Abnormal uterine bleeding (AUB). The present study was carried out in the Gynecology OPD of IMS & SUM Hospital, Bhubaneswar, Odisha. The women aged between 35 to 50 yrs, can understand Odia language and were available during data collection period were included in the study. Women undergone menopause and were not willing to give consent were excluded from the study. Total 150 women were selected for the study by using purposive sampling technique. Institutional Ethical Committee (IEC) and administrative permission was taken from IMS & SUM Hospital. The tools used to collect the data were as follows: (1) Demographic questionnaire to assess the demographic characteristics, Questionnaire to assess the contributing factors of AUB, PSQI scale to assess sleep quality and Beck Depression Inventory scale was used to assess depression. Data was collected by interview schedule. The data were analysed using descriptive and inferential statistics with SPSS 21 version.

## RESULTS

### Demographic characteristic of women with abnormal uterine bleeding (AUB)

Demographic characteristics of women with AUB shows that highest percentage of women belongs to the age group of 46-50 years (46.66%), had primary and secondary education (31.34%). Occupation of women shows that 62% of women were house wife and 38% of women were working. Among the

working women highest percentage (28.66%) were skilled worker. Highest percentage of women had duration of married life between 20-24 year (30.67%), had family income between Rs 5,000-10,000 (39.35%), belongs to nuclear family (66%) and from urban residence (54%).

Highest percentage (64%) of women belongs to the normal BMI (18.5-24.9). Approximately 3/4<sup>th</sup> of women perceiving mental stress (72.67%) and undergone normal vaginal delivery as a mode of delivery (71.34%). Half of the women (50.66%) had the family history of AUB. Most of the women (96%) were diagnosed with gynaecological diseases. Among them highest percentage of women (36.7%) diagnosed with Adenomyosis and followed by Leiomyoma (29.25%), Polyp (20.82%), PCOD (4.2%), Malignancy (4.18%), Ovarian cyst (0.69%) and any other condition (4.16%). Highest percentage of women had heavy menstrual flow (74%) and had polymenorrhea (67.34%) i.e having menstrual cycle less than 21 days.

Table 1 shows that sleep quality of women with AUB. Individual domain score ranges from 0-3. Highest score indicates poorer the sleep quality. Highest mean score seen in sleep duration domain i.e 2.32±0.78 and lowest score seen in sleep medication domain i.e 0.30±0.61. Remaining domain scored between 1-2 i.e sleep quality (1.47±0.83), sleep latency (1.61±1.93), sleep efficiency (1.7±1.81), sleep disturbance (1.65±1.04) and day time dysfunction (1.62±0.67). And Global score is 10.69±4.12. Score interpretation shows that the person score  $\geq 5$  indicate poor sleep quality. Hence, it can be interpreted that the women with AUB had poor sleep quality.

Table 2 shows that the level of depression among the women with Abnormal uterine bleeding. Highest percentage (39.33%) of women had severe depression according to score, followed by 29.33% had moderate depression and 11.33% had extreme depression where as 8.66% and 6.66% had mild, borderline depression respectively. Only less than 5% (4.66%) were normal. Hence, it can be interpreted that most of the women were depressed due to AUB.

Chi square test was computed to find out the association between demographic characteristics and sleep quality of women with AUB. There was a significant association found between sleep quality, amount of menstrual flow ( $\chi^2=7.925, p=0.019$ ), mode of delivery ( $\chi^2=14.317, p=0.003$ ) respectively. And there was a significant association found between level of depression and stress ( $\chi^2=10.886, p=0.054$ ), amount of menstrual flow ( $\chi^2=19.540, p=0.034$ ) respectively.

**Table 1: Domain wise Quality of life of women with AUB .**

N=150

SI No	Components	Score Range	Mean±SD
1	Sleep Quality	0-3	1.47±0.83
2	Sleep Latency	0-3	1.61±1.93
3	Sleep Duration	0-3	2.32±0.78
4	Sleep efficiency	0-3	1.7±1.81
5	Sleep disturbance	0-3	1.65±1.04
6	Sleep medication	0-3	0.30±0.61
7	Day time dysfunction	0-3	1.62±0.67
PSQI global score		0-21	10.69±4.12

**Table 2: Level of depression among women with Abnormal Uterine Bleeding**

N=150

SI No	Characteristics	Score Range	Frequency	Percentage (%)
1	Normal	1-10	7	4.66
2	Mild depression	11-16	13	8.66
3	Borderline	17-20	10	6.66
4	Moderate depression	21-30	44	29.33
5	Severe depression	31-40	59	39.33
6	Extreme depression	Over 40	17	11.33

## DISCUSSION

In present study, most of the women (46.66%) were between the age group of 46-50 years. Iniyava RI et.al (2019) stated that maximum participants (78%) were in age group of 40 years and above.<sup>16</sup>Rath BA et.al(2015)in his study found that the women in the age group of 40-50 more were affected by AUB,14-25%of women were in the reproductive age.<sup>17</sup> Sedhi LB et.al (2019) stated that maximum women(50.9%) aged more than 40years were affected.<sup>18</sup>

In present study, majority of the women (75.34%)were multiparous ,most of the women (74%) had heavy menstrual bleeding, majority of women (39.33%) suffered from anaemia, most of the women (53.33%) were having menorrhagia, majority of women (96%) were diagnosed with gynaecological diseases. Among them, 35.33% had adenomyosis and 29.33% had leiomyoma.

Lakshmi ST et.al (2018) found that multiparous women (87%) were at highrisk of developing AUB,47% of women had leiomyoma, 70% of women was complaint of heavy menstrual bleeding, majorityofwomenwas developed Anaemia.<sup>19</sup> Iniyava RI,et.al found that highest percentage (34.1%) of women had adenomyosisas a major contributing factor.<sup>20</sup>

In present study highest mean score seen in sleep duration domain i.e  $2.32 \pm 0.78$  and sleep medication scored very least score i.e  $0.30 \pm 0.61$ . And Global score  $10.69 \pm 4.12$  shows more than  $> 5$  which indicate poor sleep quality. Kathryn E.R et.al (2020) found that short sleep duration was associated with heavier bleeding ( $p=0.026$ ) and menstrual irregularities ( $p=0.031$ ) as compared with normal sleep.<sup>21</sup>

In present study highest percentage (39.33%) of women had extreme depression, whereas 8.66% and 6.66% had mild depression and moderate depression respectively.Lee HNet.al found that, out of 124 patients,47 (37.9%) metthecriteriafor anxietyand 24(19.5%) metthe criteria for depression.<sup>22</sup>Plotnik Get.al found that 29% of women showed moderated

depression.<sup>23</sup>Kayhan F et.al found that the most common psychiatric disorder in patients with AUB were major depression( $n=15,15.6\%$ ).<sup>24</sup>

## CONCLUSION

This study found that AUB impact on sleep quality and depression.The burden of AUB needs further thorough investigation. Additionalresearchshallbedoneprospectively to evaluate the effect of treatment provided to guide future health resource allocation and clinical decision-making.

**Conflict of Interest:** Nil

**Source of Support:** Self

**Ethical Clearance:** Ethical clearance was obtained from institutional ethical committee. Confidentiality of subjects was ensured.

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# A Study to Assess the Effectiveness of Video-Assisted Teaching Programme on Knowledge and Practice Regarding the Prevention of Hospital-Acquired Infection Among the Students in Chettinad College of Nursing

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## ABSTRACT

**Background:** Nosocomial infections are defined as those infections which occur among patients admitted in hospitals and become manifest after 48 hours of stay, and are neither present nor incubating at the time of hospital admission. The purpose of the study was to evaluate the effectiveness of video-assisted education in helping nursing students at Chettinad College of Nursing gain information and skills related to preventing hospital-acquired infections. The study's goal was to evaluate the existing level of knowledge and practice regarding the prevention of hospital-acquired infection.

**Objective:** To evaluate the effect of video teaching programs on knowledge and practice regarding the prevention of hospital-acquired infection, and to find the association between the pre-test and post-test scores with the different demographic variables.

**Methods:** Quasi-experimental research design was used for the study. 80 college students from Chettinad college of nursing were selected by randomized sampling technique. The questionnaire and checklist were used to collect data. The data collected were properly screened before they were analyzed.

**Results:** The data were analyzed and tabulated. The study finding shows that (83.3%) n=70 has inadequate knowledge and practice (7.1%) n=6 has moderate knowledge and practice and (4.8%) n=4 has moderate knowledge and practice. After the video teaching, it shows that (3.6%) n=3 has inadequate knowledge and practice (9.5%) n=8 has moderate knowledge and practice, and (82.1%) n=69 has moderate knowledge and practice. The study shows there is no significant association between knowledge and practice demographic variables like gender, age, year of study, medium, or media exposure and posting.

**Keywords:** hospital-acquired infection, college students

## INTRODUCTION

The terms healthcare-associated infections, hospital-acquired infection (HAI), and

nosocomial infections (Greek: nomos-disease, Komen-to take care of, refers to hospitals) are defined as those infections which occur

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among patients admitted in hospitals and become manifest after 48 hours of stay and are neither present nor incubating at the time of hospital admission. Such infections may become evident during their stay in the hospital or, sometimes, only after their discharge.<sup>1</sup>

Nosocomial infections can be controlled by practicing contamination control programs, retaining a test on antimicrobial use and its resistance, and adopting antibiotic manipulation coverage. The maximum common negative occasion in healthcare that compromises an affected person's safety is HAI. They place a heavy economic strain on sufferers, households, and healthcare systems in addition to appreciably expanded morbidity and mortality. Any other trouble with HAI is the upward thrust of multi-drug resistance microbes. HAI affects 3.2% of all hospitalized patients inside the USA. and, 6.5% within the EU Union/ EU monetary area and worldwide occurrence are probably a whole lot higher.<sup>2</sup>

A nosocomial infection has both long-term and short-term effects, including a prolonged stay at the hospital, chronic diseases, mortality, morbidity, temporary and permanent dysfunction, and excessive treatment activity, all of which result in significant cost overruns for the healthcare system. NI can be prevented by infection control and it can help to reduce medical costs. The infection control guideline series has assisted healthcare workers to provide quality care to patients. Some studies conclude that there is a lack of adequate knowledge, attitude, and practice regarding nosocomial infection among healthcare workers. The importance of prevention of nosocomial infection should be emphasized in health care workers.<sup>3</sup>

The World Health Organization (WHO) revealed that the prevalence rate of HAIs in high-income countries (HICs) ranged between 5.1 to 11.6 % globally. HAIs have a variety of negative effects on patients, families, and healthcare systems, including higher morbidity and mortality, longer

hospital stays, laboratory tests, and risks of antibiotic resistance. According to WHO, HAIs directly cause an estimated 1,40,000 mortality and have an economic effect of US\$6.5 billion (only in the USA in 2004). More severe consequences on health outcomes and costs are caused by bloodstream infections and ventilator-associated pneumonia. HAI has been found to affect five- 10 percent of health center patients and the converting transport of health care services is possible to affect similarly the character and value of HAI. On the one hand, the increasing use of equal-day surgical procedures and the trend for shorter lengths of health facility pathogen and invasive devices. so that the investigator chose a topic and enhance the knowledge level of a few of the workforce and management.<sup>4</sup>

## SUBJECT AND METHODS

- **Research Approach:** Quantitative approach
- **Research Design:** Quasi-experimental research design
- **Setting of study:** Chettinad College of Nursing
- **Sample:** B.Sc. Nursing 1st year students
- **Sample size:** 80

### Inclusion Criteria

1. Students studying B. Sc nursing the first year.
2. Both female males between the age of 19-21 years,
3. Who were available during the time of data collection and
4. Who could read and write Tamil and English were included in the study.

### The tools had 3 parts

- **Part 1:** Demographic Variables
- **Part 2:** Knowledge questionnaire on prevention of hospital acquired infection
- **Part 3:** Practice checklist on prevention of hospital acquired infection

## RESULTS

**Table 1: Frequency and Percentage Distribution on The Pretest**

PRETEST RESULTS		
	Frequency	Percentage
Inadequate Knowledge & Practice	70	83.3
Moderate Knowledge & Practice	6	7.1
Adequate Knowledge & Practice	4	4.8

**Table 2: Frequency and Percentage Distribution on The Post-test**

POST-TEST RESULTS		
	Frequency	Percentage
Inadequate Knowledge & Practice	3	3.6
Moderate Knowledge & Practice	8	9.5
Adequate Knowledge & Practice	69	82.1

**Table 3: Association of a demographic variable with knowledge and practice**

S. NO	DEMOGRAPHIC VARIABLES	FREQUENCY	KNOWLEDGE AND PRACTICE			Df	X2VALUE
			Inadequate	Moderate	Adequate		
1.	AGE						
	a) 19-21	80	70	6	4	-	-
	b) above 21	-	-	-	-		
2.	SEX						
	a) Male	40	35	3	2	2	1.000(NS)
	b) Female	40	35	3	2		
3.	CLASS						
	a) 1st Year	80	70	6	4	-	-
	b) 2nd Year	-	-	-	-		
	c) 3rd Year	-	-	-	-		
	d) 4th year	-	-	-	-		
4.	CLINICAL POSTING						
	a) Yes	80	70	6	4	-	-
	b) No	-	-	-	-		
5.	MEDIUM OF CLASS						
	a) English	78	68	6	4	4	.990
	b) Tamil	1	1	0	0		
	c) Others	1	1	0	0		
6.	MEDIA EXPOSURE						
	a) Yes	27	24	1	2	2	0.531
	b) No	53	46	51	2		

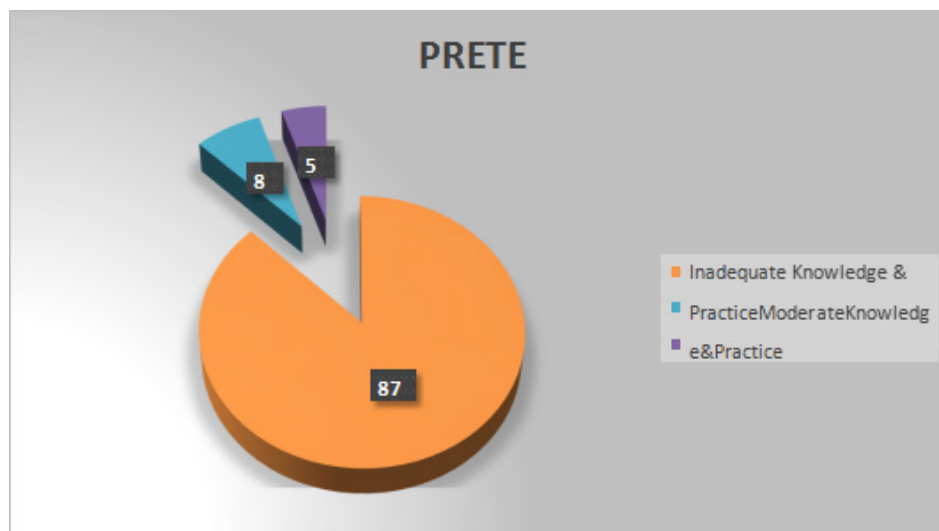


Fig 1: Pretest results

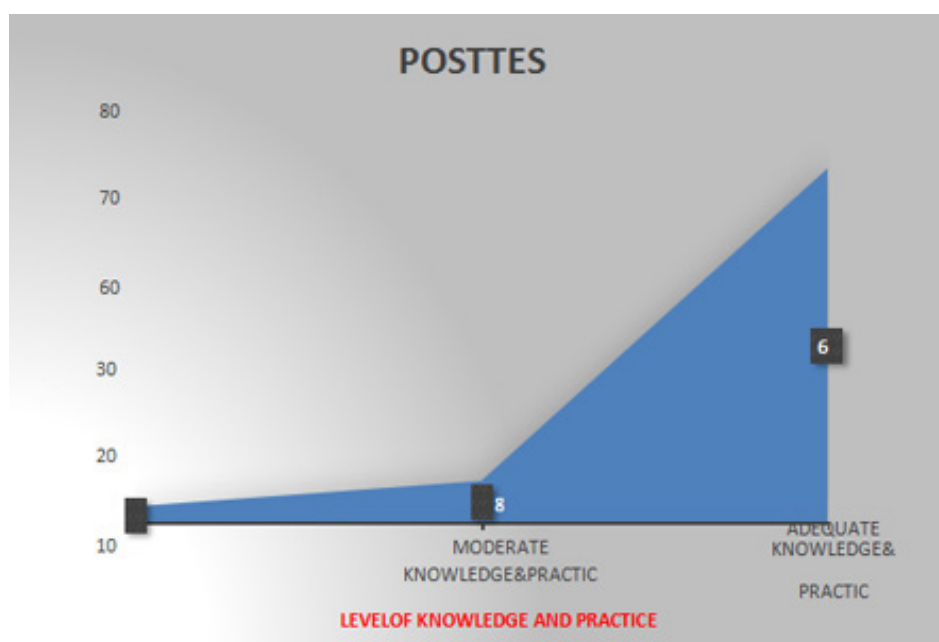


Fig 2: Post-test results

## FINDINGS:

In a total of 80 respondents, in the pre-test, the frequency and percentage of knowledge and practice scores of college students regarding hospital-acquired infection show that 83.3% of them had inadequate knowledge and practice, 7.1% had moderate knowledge & practice and 4.8% had adequate knowledge & practice. whereas in the post-test the frequency and percentage of knowledge and practice scores of college students regarding hospital-acquired infection show that 82.1% of them had adequate knowledge and

practice, 9.5% had moderate knowledge & practice and 3.6% had inadequate knowledge & practice. Demographic variables including age (p value=nil), sex (p value=1.000), class (p value=nil), clinical posting (p value=nil), medium of class (p value=0.990), and media exposure (p value=0.521) were significantly not associated with knowledge and practice of 1<sup>st</sup> year B. Sc nursing students.

## CONCLUSION

In this study, the structured interview schedule was provided to the college students

fulfilling the inclusion criteria to determine their knowledge and practice regarding the effectiveness of video-assisted teaching programs on the prevention of hospital-acquired infection among the students. The majority of the college students had the highest percentage of inadequate knowledge and practice in the pre-test, whereas the majority of college students who participated in the video-assisted teaching program (post-test) had sufficient knowledge and practice in preventing hospital-acquired infections. The study finding obtained by the researcher shows that there was significant Effectiveness of video-assisted teaching in knowledge and practice regarding the prevention of hospital-acquired infection among the students in Chettinad college of nursing.

**Conflict of interest:** Nil

**Source of funding:** Nil

**Ethical Clearance:** The Institutional Ethical Committee and UG Committee clearances were acquired from CARE. The HOD of the

Medical surgical nursing department, Chettinad college of nursing as well as the HOD of the Community Health CHRI granted permission. Before the research started, the participants were aware of its objective and gave their written consent. The participants were made aware that they might leave the study at any time during the research period and that the confidentiality of the information obtained would be preserved and used only for that purpose.

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# Electronic Survey about Current Update of CORONAVirus Variants

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## ABSTRACT

WHO, in association with partners, expert networks, national authorities, institutions and researchers have been monitoring and assessing the evolution of SARS-CoV-2 since in the month of January 2020. At the current time, this expert group summoned by WHO has endorsed using letters of the Greek Alphabet like Alpha, Beta, Gamma, Delta which will be easier and more applied to be conferred by non-scientific spectators. The efficiency of the current COVID vaccines is fairly high. In fact, it is much advanced than some other vaccines we generally receive. As an aide-memoire, the annual flu vaccine has an efficacy around 40-60 percent from year to year. Numerous theories are on the surface to explain how the Omicron has congregated such a high number of mutations within less time. Few of them are advanced mutation rates within a subgroup of population and then its introduction to a larger population, long term perseverance and evolution of the virus in immune-compromised patients, and epizootic infection in animals from humans, where under dissimilar immune pressures the virus metamorphosed and then got reintroduced to humans. Transmission of SARS-CoV-2 is thought to occur primarily through revelation to respiratory droplets. Breathe out droplets or particles can also deposit the virus onto exposed mucous membranes. Though a numerous number of variants will cause the COVID infection still proper precautionary measures can prevent the transmission of this infection.

**Keywords:** SARS-CoV-2, OMICRON, Pfizer-BioNTech vaccine, Acquired immunity, Genetic marker, Transmissibility.

## INTRODUCTION

All viruses, together with SARS-CoV-2, the virus that reasons COVID-19, change over time. Most variations have little to no impact on the virus' chattels. Though, some changes may disturb the virus's possessions, such as how easily its blowouts, the associated disease harshness, or the recital of vaccines, therapeutic medicines, diagnostic tools, or other public health and social measures. **The first variant** to emerge was the B.1.1.7 variant, which was initially detected in the UK in December 2020. This variant has a higher transmissibility rate than the original SARS-CoV-2 virus and has rapidly spread to other

countries worldwide. The B.1.1.7 variant is believed to be around 50% more transmissible than the original virus and has been associated with increased hospitalizations and deaths. **The second variant** to emerge was the B.1.351 variant, first identified in South Africa in October 2020. This variant also has a higher transmissibility rate and is associated with increased hospitalizations and deaths. The B.1.351 variant has been shown to have some resistance to antibodies produced by previous infections or vaccinations, raising concerns about the efficacy of current vaccines against this variant. **The third variant** is the P.1 variant, first identified in Brazil in January 2021.

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This variant is also more transmissible and has been associated with a higher risk of reinfection, meaning that individuals who have previously been infected with the original virus may still be susceptible to this variant. Like the B.1.351 variant, the P.1 variant has also been associated with reduced vaccine efficacy. **The most recent variant** to emerge is the B.1.617 variant, first identified in India in October 2020. This variant has two sub-lineages, B.1.617.1 and B.1.617.2, which have been associated with increased transmissibility and hospitalizations. The B.1.617.2 variant has also been identified in the UK, where it has quickly become the dominant variant, leading to increased concern about its potential spread globally. At the current time, this expert group summoned by WHO has endorsed using letters of the Greek Alphabet like Alpha, Beta, Gamma, Delta which will be easier and more applied to be conferred by non-scientific spectators. When using this naming scheme and referring to the genomic order of SARS-CoV-2 recognized from the first cases (Found in December 2019), the term index viruses should be used.<sup>1</sup>

WHO and its international networks of professionals are monitoring changes to the virus so that if noteworthy amino acid substitutions are recognized, we can inform countries and the public about any variations that may be required to respond to the variant, and prevent its spread. Globally, systems have been reputable and are being wired to detect "signals" of potential VOIs or VOCs and assess these based on the risk posed to global public health. National authorities may choose to elect other variants of local interest/concern. At present scenario COVID contagion creates a pandemic and cruel lethal situation globally. First case of Corona virus infection testified in **Wuhan City of China in December 2019**. Beginning from normal fever & common cold it becomes spartan with the symptoms of struggled breathe, tenacious fever, loss of taste & smell etc. It spreads through air from human to human as a form of droplet infection.<sup>2</sup>

## METHODOLOGY

We accomplished a Cochrane, PubMed, Google Scholar pursuit in the month of February 2023 by using the phrases Corona virus current variants, variants of Corona virus, detonation of corona virus etc. Our research was both time and money-efficient. The search borne a number of scientific papers, including review articles, case reports, case series, and small clinical studies. Along with some regional non-English language reports we had comprehended the essence of the articles notwithstanding of publication dates.

## HOW CORONA VIRUS VARIANTS ARE DIFFERENTIATED

The U.S. Department of Health and Human Services established a SARS-CoV-2 Interagency Group to augment coordination among CDC, NIH, FDA, BARDA and DoD. This interagency group is engrossed on the quick characterization of incipient variants and actively monitors their probable impact on critical SARS-CoV-2 countermeasures, including vaccines, therapeutics, and diagnostics.

The SIG meets frequently to evaluate the risk posed by SARS-CoV-2 variants mingling in the United States and to make endorsements about the classification of variants. This evaluation is undertaken by a group of subject matter specialists who assess available data, including variant proportions at the national and regional levels and the potential or known impact of the assemblage of alterations on the efficiency of medical countermeasures, brutality of disease, and ability to spread from person to person.

- VBM- View current VBM in the United States that endure to be scrutinized and characterized by federal agencies
- VOI- Currently, no SARS-CoV-2 variants are elected as VOI
- VOC- View current VOC in the United States that are being meticulously observed and characterized by federal agencies

- VOHC- Presently, no SARS-CoV-2 variants are nominated as VOHC

\*Each variant of CORONA virus includes the possible traits of lower classes; variant status might intensify or diminish based on incipient scientific evidence. This page will be updated as needed to show the alternates that belong to each class. The WHO also classifies variant viruses as variants of alarm and variants of interest; U.S. classifications may fluctuate from those of WHO because the impact of variants may differ by location. To assist with public deliberations of variants, WHO proposed using labels entailing of the Greek alphabet (for instance, alpha, beta, gamma) as an applied way to discuss variants for non-scientific spectators.

## VARIANTS

### 1. VBM

CDC screens all variants circulating in the United States. Variants elected as VBM include those where data directs there is a latent or clear impact on agreed or authorized medical counter measures or that have been allied with more severe disease or amplified transmission but are no longer sensed, or are circulating at very low levels, in the United States. These variants continue to be faithfully scrutinized to identify changes in their scopes and new data are recurrently being analysed.

### 2. VOI

A variant with exact genetic markers that have been accompanying with changes to

WHO Label	Pango Lineage	Date of Designation		
		VOC	VOI	VBM
Alpha	B.1.1.7 and Q lineages	December 29, 2020		September 21, 2021
Beta	B.1.351 and descendent lineages	December 29, 2020		September 21, 2021
Gamma	P.1 and descendent lineages	December 29, 2020		September 21, 2021
Delta	B.1.617.2 and AY lineages	June 15, 2021		April 14, 2022
Epsilon	B.1.427 B.1.429	March 19, 2021	February 26, 2021 June 29, 2021	September 21, 2021
Eta	B.1.525		February 26, 2021	September 21, 2021
Iota	B.1.526		February 26, 2021	September 21, 2021
Kappa	B.1.617.1		May 7, 2021	September 21, 2021
N/A	B.1.617.3		May 7, 2021	September 21, 2021
Zeta	P.2		February 26, 2021	September 21, 2021
Mu	B.1.621, B.1.621.1			September 21, 2021

receptor binding, abridged counteraction by antibodies caused against earlier contagion or vaccination, abridged efficacy of treatments, probable diagnostic impact, or foretold increase in transmissibility or disease sternness. Possible traits of a Variant of Interest:

- Explicit genetic markers that are prophesied to affect transmission, diagnostics, therapeutics, or immune outflow.
- Evidence that it is the reason of an increased part of cases or exceptional outbreak clusters.
- Limited pervasiveness or expansion in the US or in other countries.

A Variant of Interest might necessitate one or more suitable public health actions, including heightened sequence scrutiny, greater laboratory characterization, or epidemiological soundings to evaluate how easily the virus feasts to others, the cruelty of disease, the worth of therapeutics and whether currently permitted or authorized vaccines offer protection.

### 3. VOC

A variant for which there is indication of an upsurge in transmissibility, more severe disease, significant lessening in offsetting by antibodies generated during preceding infection or vaccination, reduced efficiency of treatments or vaccines, or diagnostic recognition failures. In addition to the possible traits of a variant of interest, indications and effect on diagnostics, treatments, or vaccines, widespread meddling with diagnostic test targets, evidence of considerably diminished vulnerability to one or more class of therapies, evidence of significantly diminished neutralization by antibodies generated during preceding infection or vaccination.

Evidence of abridged vaccine-induced protection from severe disease

- Indications of increased transmissibility
- Indications of increased disease severity

Variants of concern might require one or more suitable public health actions, such as reported to WHO under the International Health Regulations, broadcasting to CDC, local or provincial efforts to control spread, augmented testing, or research to regulate the effectiveness of vaccines and treatments against the variant. Based on the features of the variant, further considerations may embrace the development of new diagnostics or the amendment of vaccines or treatments.

### 4. VOHC

A VOHC has clear proof that deterrence MCMs have pointedly reduced effectiveness relative to formerly circulating variants. Possible features of a variant of high consequence.

Impact on MCMs

- ◆ Demonstrated failure of diagnostic test boards
- ◆ Evidence to suggest a momentous reduction in vaccine effectiveness, an excessively high number of contagions in vaccinated persons, or very low vaccine-induced defence against severe disease
- ◆ Suggestively reduced susceptibility to multiple EUA or permitted therapeutics
- ◆ More severe clinical disease and enlarged hospitalizations

### THE MOST RECENT VARIANT-OMICRON

The Omicron variant (B.1.1.529) was first spotted in specimens collected on the month Nov. 11 in 2021, in Botswana. Experts in South Africa first stated the Omicron variant to the WHO on November 24 in the year 2021. They exposed the variant after COVID-19 infections abruptly began to go up. The WHO grouped Omicron as a VOC. Specialists are keeping a close eye on how the variant spreads or progresses. Experts found that one specific PCR test doesn't recognize one of the three target genes in people infested with Omicron. Because of this, these tests can unambiguously mark positive Omicron cases and, because of

WHO label	Lineage + additional mutations	Country first detected (community)	Spike mutations of interest	Year and month first detected	Impact on transmissibility	Impact on immunity	Impact on severity	Transmission in EU/EEA
Omicron	<a href="#">BA.2</a>	South Africa	(y)	November 2021	Increased (v) (1, 2)	Increased (v) (3)	Reduced (v) (4, 5)	Community
Omicron	<a href="#">BA.4</a>	South Africa	L452R, F486V, R493Q	January 2022	No evidence	Increased (6, 7)	No evidence	Community
Omicron	<a href="#">BA.5</a>	South Africa	L452R, F486V, R493Q	February 2022	No evidence	Increased (6, 7)	Unclear (8)	Dominant

that, can spot this variant faster than with preceding surges.

In the interim, specialists recommend protecting ourselves by getting the vaccine or a booster if we are eligible for it. People should wear mask and continue with social distancing if the COVID-19 community level infection rates are high. Call doctor notices symptoms of Omicron “stealth” variant (BA.2): Scientists call it Omicron BA.2 as contrasting to the original Omicron variant, BA.1. At first, scientists supposed BA.2 wasn’t as contagious as BA.1 and would soon fade away. That didn’t occur, and preliminary in January 2022, BA.2 appeared to be at least as easy to transmit as BA.1. As of the end of February 2022, BA.2 showed signs of spreading more easily than other variants, though it didn’t seem to cause more grave symptoms. The WHO has said that BA.2 is a “variant of concern.” The best defence is still the coronavirus vaccine.<sup>3</sup>

#### **4<sup>THE FIRST VARIANT</sup>**

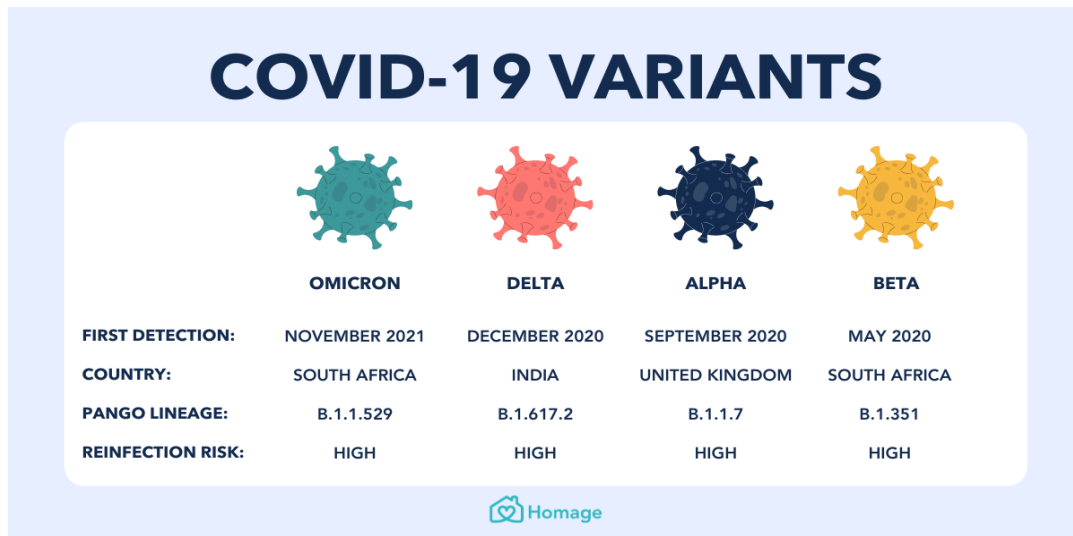
Earlier in the year 2020, when the pandemic was new, we might have heard that there was more than one strain of the novel coronavirus. The theory about dissimilar variants of the new coronavirus came from a study in China. Researchers were studying changes in coronavirus RNA over time to figure out how various coronaviruses are

correlated to each other. They observed near about 103 samples of the new coronavirus obtained from people, and they looked at coronaviruses from animals. There were two different types, which the researchers named “L” and “S.” They’re very analogous, with slight alterations in two places. It looks like the S type originated first. But the researchers say the L type was more common primary in the outbreak.<sup>5</sup>

#### **EARLIER CORONAVIRUS VARIANTS**

- **Alpha (B.1.1.7).** In the year late 2020, experts distinguished gene mutations in COVID-19 cases seen in people in southeastern England. This variant has subsequently been stated in other countries, as well as the U.S. Scientists estimate that these mutations could make the virus up to 70% more communicable, meaning it could blowout more effortlessly. Some research has associated this variant to a higher risk of death, but the indication isn’t robust.<sup>6</sup>

The mutation on the Alpha variant is on the spike protein, which helps the virus contaminate its host. This is what COVID-19 vaccines aim. These vaccines make antibodies in contradiction of many parts of the spike protein, so it’s unlikely that a single new transformation in the Alpha variant will make the vaccine less operative.<sup>7</sup>



- **Beta (B.1.351).** This variant was first found in other countries, together with South Africa and Nigeria. The Beta variant seems to feast more easily than the original virus but doesn't seem to cause inferior illness.
- **Gamma (P.1).** In January 2021, specialists speckled this COVID-19 variant in people from Brazil who would travel to Japan. By the end of that month, it was showing up in the U.S.
- **Delta (B.1.617.2).** This variant was marked in India in December 2020. It caused an enormous surge in cases in mid-April 2021, quickly scattering crossways the globe.
- **Mu (B.1.621).** Specialists first dotted this COVID-19 variant (pronounced m'yoo) in Colombia in January 2021. Meanwhile then, countries in South America and Europe have informed outbreaks of Mu.<sup>8</sup>
- **R.1.** Scientists first noticed R.1 in numerous countries together with Japan. There was a flare-up at a Kentucky nursing home in March 2021, when an unvaccinated health care worker conceded it to about 45 other staff as well as residents.
- **Epsilon, Theta, and Zeta** were at one point recorded as variants of interest and were demoted by the WHO. They are still being scrutinized.

### THE COVID VACCINES ARE HIGHLY ACTIVE

A COVID-19 vaccine is a vaccine envisioned to provide acquired immunity aim to SARS-CoV-2, the virus that causes coronavirus disease the year 2019 (COVID-19). In Phase III trials, several COVID-19 vaccines have confirmed effectiveness as high as 95% in averting symptomatic COVID-19 infections. Nearly twenty vaccines have been accepted by at least one national regulatory authority for public use: nine conformist incapacitated vaccines, two RNA vaccines, one viral vector vaccines, and four protein subunit vaccines.<sup>9</sup>

### COVID BOOSTERS UPSURGE IMMUNE RESPONSE

According to CDC data from clinical trials disclosed that a booster shot augmented the body's immune response. With an increased immune response, people should have enhanced protection in contradiction of getting infested with COVID-19, including the Delta variant. Clinical tribunals also exhibited that a booster shot helped avert COVID cases in which symptoms developed.<sup>10</sup>

### CONCLUSION

In conclusion, the emergence of coronavirus variants has highlighted the continued threat posed by the virus to global public health. These variants are more transmissible,



associated with increased hospitalization and death rates, and have reduced vaccine efficacy. It is essential that public health measures are continued and scaled up to mitigate the spread of the virus and its variants, and that global efforts are made to increase vaccine access and distribution to reduce the spread of the virus worldwide.<sup>11</sup>

## LIST OF ABBREVIATIONS

- EUA-Emergency Use Authorization
- SARS-CoV-2 -Severe Acute Respiratory Syndrome Coronavirus 2
- VBM-Variants Being Monitored
- VOI-Variant of Interest
- VOC-Variant of Concern
- VOHC-Variant of High Consequence
- GISAID-Global Initiative on Sharing All Influenza Data
- NIH -National Institutes of Health
- FDA -Food and Drug Administration
- BARDA -Biomedical Advanced Research and Development Authority

CONFLICT OF INTEREST-Have no conflict of interest relevant to this article

SOURCE OF FUNDING: Self (review article), No financial assistance was provided related to this article.

ETHICAL CLEARANCE - Not required

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# Sudanese Nursing Students' Satisfaction Level and Clinical Learning Environment: A Cross-Sectional Study

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## ABSTRACT

**Background:** The clinical learning environment is crucial for student nurses' skill acquisition and satisfaction in clinical settings. This study aimed to evaluate the relationship between Sudanese student nurses' satisfaction with clinical placements and the clinical learning environment. The study focused on the impact of students' perceptions of their learning environment on their satisfaction levels.

**Methods:** The study was an analytical cross-sectional study that recruited 204 Sudanese student nurses. Participants completed a questionnaire consisting of socio-demographic information, satisfaction with clinical assignments, and the Clinical Learning Environment Scale (CLES). Statistical analyses included descriptive and bivariate analyses, the Mann-Whitney U test, the Kruskal-Wallis test, Spearman correlation, and ordinal logistic regression analysis.

**Results:** The mean satisfaction score was 5.3, with no significant difference between male and female participants. The hospital manager's leadership style had the highest score among the CLES dimensions, while the supervisory relationship had the lowest score. The study found a significant positive correlation between satisfaction level, overall CLES score, and all CLES dimensions. The regression analysis showed that the supervisory relationship and the pedagogical atmosphere in the hospital were the most significant predictors of satisfaction level, while the overall score had the weakest relationship with the outcome variable.

**Conclusion:** Assessing the clinical learning environment is essential to improving student learning outcomes and ensuring a positive educational experience for student nurses. The study recommends paying attention to dimensions with lower scores, such as the supervisory relationship, while maintaining and enhancing dimensions with higher scores, such as the hospital manager's leadership style.

**Keywords:** Clinical environment, clinical learning, nurse student, Supervisory relationship, Satisfaction, Sudan.

## INTRODUCTION

When it comes to nursing education, clinical placement evaluation is a major issue as it accounts for around half of what students learn<sup>1</sup>. As a result, the information gleaned from clinical assignment assessments could be used in the education of new nurses, ultimately leading to higher patient satisfaction. Skill gaining and student satisfaction while training in the clinical context is affected by some factors. Regarding

student learning, these factors include the students' assessment of a suitable educational environment and the adequate involvement of clinical nurses<sup>2,3</sup>. A prior study found that the mentioned factors directly impact the ability of nursing students to learn clinical knowledge<sup>1</sup>. Because half of the competencies are learned and evaluated in the clinical context, curriculum design must be rethought to ensure that theoretical and practical parts are given equal weight.<sup>1</sup>

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Students' perceptions of the learning environment should be studied in light of excellent quality principles. Several tools have been employed to evaluate the clinical learning environment in recent years, including the Clinical Learning Environment and Supervision (CLES) scale.<sup>24</sup> Nursing students can use this instrument to assess various important concepts, including supervisory relationships, the ward educational climate, the role of nursing tutors in medical training, the ward manager's way of leadership, and the ward's nursing precepts and facilities. Various clinical settings, including hospitals and older people's homes, have used this scale.<sup>5-8</sup> Many languages have been used to verify CLES scale validity and its implementation in countries worldwide.<sup>9</sup> This multilingual tool is now used to evaluate the quality of the clinical learning process in many different settings.

The clinical education setting was the primary focus of most published studies.<sup>4,6,7</sup> In addition, the researcher examined the suitability of evaluating the influence of students' perceptions of their learning environment on student satisfaction levels in the clinical setting while conducting this study. To the knowledge, no previous studies have been conducted in this context on Sudanese students. Therefore, this study aims to evaluate the relationship between Sudanese student nurse satisfaction with clinical placements and the clinical learning environment.

## METHODS

### Study design and criteria

Between September and November 2022, the researcher distributed the survey to conduct this analytical cross-sectional study. All undergraduate nursing students were eligible to be included, while postgraduate nurses, paramedical students, and students refusing to participate were excluded.

### Study Procedures

The study used a three-part questionnaire to assess the variables. The first part collected

demographic information, the second part used a 10-point scale to measure satisfaction with clinical assignments, and the third part used the CLES scale to evaluate the clinical learning environment. The CLES scale had 34 items grouped into five dimensions. Cronbach's alpha was 0.956 on the original scale.

### Data handling

The questionnaire was distributed online on the educational platforms of the relevant nursing students and their social media platforms. It was also forwarded to the academic E-mails of the students. The data confidentially followed until the end of the data collection period. Then all data were gathered, cleaned, coded, and prepared for analysis.

### Data analysis

This study analyzed data collected through surveys and performed descriptive and bivariate analyses, using non-parametric tests to compare groups. The association between student satisfaction with clinical placements and the Clinical Learning Environment Scale (CLES) results was examined using the Spearman correlation test. An ordinal logistic regression analysis was conducted, and the p-value of significance was less than 0.05. SPSS version 25 was used for all statistical analyses.<sup>10</sup>

## RESULTS

### Participants' characteristics

The study recruited 204 Sudanese nurses with 170 female participants (83.3%). The mean age of participants was 21.75 ranging from 17 to 34 years. The mean for all participants' satisfaction was 5.3; for males, it was 5.28, and for females was 5.38. *Table 1* summarizes the participant's demographic characteristics.

### CLES score evaluation

The overall score mean was  $3.17 \pm 0.81$  points, the hospital manager's leadership style was the highest score in the scale dimensions with  $3.3 \pm 1$  points, while the supervisory

relationship was the lowest score among dimensions with  $3.04 \pm 0.86$  points. The inferential statistics revealed no statistically significant difference between males and females regarding CLES dimensions. *Table 2* shows the CLES score analysis and the full questionnaire items are shown in *Appendix 1*.

### Analysis of satisfaction level and learning environment

The study found that only a small percentage of nurses were very satisfied or not satisfied at all with their learning experience, with the majority choosing a score of five out of ten. There was no significant gender difference in satisfaction levels. The analysis also showed a significant positive correlation between satisfaction levels and all CLES dimensions, as well as the overall CLES score as shown in (*Table 3*).

The correlation coefficient (R) of overall CLES and satisfaction level was 0.388, and the p-value was  $> 0.001$ . Furthermore, ordinal logistic regression was conducted using nurses' satisfaction level as a dependent variable and CLES score as an independent variable. All predictor variables are statistically significant ( $p < 0.001$ ) and positively associated with the outcome variable. "Supervisory relationship" and "The pedagogical atmosphere in the hospital" had the highest coefficient estimate of 0.939 and 0.932, respectively and a p-value of  $< 0.001$ , indicating a strong positive association and prediction for the satisfaction level. The overall score variable also has a positive coefficient. Still, it is the smallest of all predictors, indicating that it has the weakest relationship with the outcome variable among all predictors. The pseudo- $R^2$  value of 0.042 suggests that the model explains only a

**Table 1: General demographics**

Basic characteristics	Mean $\pm$ SD	Median	Minimum	Maximum
Age (year)	21.75 $\pm$ 2.63	22	17	34
Level of satisfaction during clinical assignments	5.3 $\pm$ 2.6	5	1	10
Female	5.28 $\pm$ 2.7	5	1	10
Male	5.38 $\pm$ 2.07	5	1	9
Sex	N (%)			
Female	170 (83.3%)	-	-	-
Male	34 (16.7%)	-	-	-

\*N= Numbers, SD= Standard Deviation

**Table 2: CLES score evaluation**

CLES	Mean (SD)	Group	Gender Mean (SD)	P-value
Supervisory relationship	3.04 (0.86)	Female	3.02 (0.904)	0.365
		Male	3.16 (0.559)	
The pedagogical atmosphere in the hospital	3.11 (0.816)	Female	3.09 (0.842)	0.759
		Male	3.20 (0.669)	
Role of nursing teacher	3.21 (0.96)	Female	3.22 (0.969)	0.694
		Male	3.19 (0.925)	
The hospital manager's leadership style	3.3 (1)	Female	3.33 (1.006)	0.188
		Male	3.12 (0.981)	
The value placed on nursing in the hospital	3.18 (1.02)	Female	3.20 (1.004)	0.711
		Male	3.10 (1.096)	
Overall score	3.17 (0.81)	Female	3.18 (0.83)	0.881
		Male	3.15 (0.79)	

\*SD= Standard deviation



small portion of the variation in the outcome variable. *Table 4* illustrates the details of ordinal logistic regression.

## DISCUSSION

The study evaluated the clinical learning environment and satisfaction levels of 204 Sudanese nurses using the CLES scale. The supervisory relationship had the strongest association with satisfaction levels. Ordinal logistic regression found all predictor variables positively associated, but the overall score had the weakest relationship, and the model only explains a small portion of the outcome variation. The study involved a larger proportion of female participants, which is not surprising given that nursing is a profession

dominated by women. In line with previous studies by Bisholt et al. and Gustafsson et al., no significant gender differences in both satisfaction levels and CLES scores was found<sup>8,11</sup>. However, Cervera-Gasch et al. detected difference between males and females in their studies. They suggest that future research should consider the satisfaction levels of male nursing students, who seem to place greater value on their learning environment and thus experience higher levels of satisfaction with their clinical placements<sup>12</sup>.

In Johannessen et al. study, the second-year nursing students expressed positive evaluations of CLES during their hospital placement<sup>13</sup>. Also, few students in their study reported dissatisfaction with their relationship with the clinical preceptor. Their average score of 4.05 for CLES in hospital placement was similar to two Swedish studies<sup>8,14</sup>. Additionally, Warne et al. reported a similar score in evaluating nursing students' learning experiences in nine European countries. They found that students with at least seven weeks of hospital placement were more satisfied than those with six weeks<sup>15</sup>. Johannessen et al. found no correlations with background variables like age, sex, or study year<sup>13</sup>. While Skaalvik et al. found that first-year nursing students evaluated the CLES in nursing homes more negatively than in hospitals, Bisholt et al. found no difference in CLES satisfaction among nursing students in their last semester in different clinical settings<sup>8,16</sup>. However, the CLES scale score was lower than the results of previous literature, where their students gave high overall scores compared to us<sup>8,12-17</sup>.

**Table 3: Analysis of the correlation between the satisfaction levels and overall CLES score and all CLES dimensions.**

CLES	Level of satisfaction during clinical assignments	
	R	P.value
Supervisory relationship	0.345**	<0.001
The pedagogical atmosphere in the hospital	0.350**	<0.001
Role of nurse teacher	0.284**	<0.001
The hospital manager's leadership style	0.363**	<0.001
The value placed on nursing in the hospital	0.318**	<0.001
Overall	0.388**	<0.001

\*\*Correlation is significant at the 0.01 level (2-tailed). R= correlation coefficient

**Table 4: Ordinal logistic regression analysis**

Predictor	Estimate	SE	p	R <sup>2</sup> McF
The hospital manager's leadership style	0.765	0.136	>0.001	0.036
The pedagogical atmosphere in the hospital	0.932	0.169	>0.001	0.035
Supervisory relationship	0.939	0.164	>0.001	0.373
The value placed on nursing in the hospital	0.649	0.130	>0.001	0.028
Role of nursing teacher	0.601	0.136	>0.001	0.022
Overall score	0.030	0.005	>0.001	0.042

SE: standard error; R<sup>2</sup>McF: McFadden's R



This showed that Sudan should focus more on improving their clinical learning environment and supervision measures.

The most highly valued aspect of the CLES+T scale in Vizcaya-Moreno et al. was the “supervisory relationship,” which was in line with the findings of Gustafsson et al., Doyle et al., and Bergjan and Hertel et al.<sup>11,18,19</sup>. However, this differs from the results of other studies conducted by Comparcini et al., where the “supervisory relationship” was rated as the least important dimension<sup>20</sup>. In light of the latter finding, “supervisory relationship” had the lowest score on the CLES scale among the students.

Cervera-Gasch et al. results of multiple linear regression analysis showed that there was a positive correlation between the students’ satisfaction with their clinical placements and the CLES+T score<sup>12</sup>. They declared that their correlation was particularly strong for the “pedagogical atmosphere in the ward” dimension, while in the study, the strongest correlation was for the “Supervisory relationship” and then “The pedagogical atmosphere in the hospital”<sup>12</sup>. However, Cervera-Gasch et al. results regarding regression are doubtful as, from a methodological perspective, they used linear regression in their prediction model for satisfaction level, which was an ordinal categorical outcome, and the linear regression would not be the most appropriate in this case. Instead, ordinal logistic regression would be a better choice, which was applied in the study.

The study had a larger sample size compared to some other studies conducted on the same topic<sup>7,12</sup>. The study also included correlation and regression analyses to examine the relationship between the learning environment and supervision with satisfaction levels among Sudanese students. However, the study had limitations, including a smaller number of male participants, self-reported parameters, and potential confounders. The researcher suggested conducting high-quality studies with larger sample sizes in various settings to enhance understanding of the

observed relationships and improve nurses’ learning environment and satisfaction levels.

## CONCLUSION

The highest score was for the hospital manager’s leadership style, and the lowest was for the supervisory relationship. Satisfaction levels were positively correlated with both the overall CLES score and all CLES dimensions. The supervisory relationship and pedagogical atmosphere were the most significant predictors of nurses’ satisfaction levels. The study recommends improving dimensions with lower scores while preserving and further improving higher-scoring dimensions.

## Ethical clearance

Informed consent was obtained from all participants before they completed the online questionnaire, and they were assured of the confidentiality and anonymity of their responses.

## Data Availability Statement

The data described in this study are available upon request from the corresponding author. However, in consideration of privacy concerns, the data are not available for public access.

## Source of funding

This study did not receive any external funding.

## Conflicts of Interest

The author declares no conflict of interest.

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# A Panoramic Review Article on Effect of Therapeutic Plasma Exchange During COVID-19 Associated Pneumonia

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## ABSTRACT

TPE is a procedure in which the patient's blood is passed through an apheresis machine, where the filtered plasma is removed and discarded with reinfusion of red blood cells along with replacement fluid such as plasma or albumin in to the patient. TPE is a procedure in which the patient's blood is passed through an apheresis machine, where the filtered plasma is removed and discarded with reinfusion of red blood cells along with replacement fluid such as plasma or albumin in to the patient. Therapeutic plasma exchange showed significant effect on mortality (RR 0.41, 95% CI 0.24 to 0.69; P = 0.0008). Conclusion: TPE significantly reduced mortality in hospitalized patients with moderate-to-critical COVID-19. Plasma exchange therapy should be considered for patients with COVID-19. A review to assess the effect of TPE on the risk of mortality in patients with COVID-19-associated pneumonia, using three statistical procedures to rule out any threats to validity. Results Deaths were 6 (14%) in Group 2 and 14 (47%) in Group 1. However, different harmful risk factors prevailed among patients not receiving TPE rather than being equally split between the intervention and control group. A review article on to evaluate the safety of TPE in adult patients with serious/life-threatening COVID-19 requiring ICU admission, and associated 28-day mortality.

**Keywords:** Pneumonia, Plasma Volume Calculator, Thrombus Inflammation.

## INTRODUCTION

Therapeutic Plasma Exchange is a procedure in which the patient's blood is passed through an apheresis machine, where the filtered plasma is removed and discarded with reinfusion of red blood cells along with replacement fluid such as plasma or albumin in to the patient. The exchange of large volumes of plasma may cause shifts of fluid that can lead to changes in blood pressure, cold hands and feet or

breathlessness. Possible side effects during the treatment include dizziness, nausea or a feeling of cold.<sup>1,2,3</sup>

## ADVANTAGES OF TPE

Therapeutic plasma exchange showed significant effect on mortality (RR 0.41, 95% CI 0.24 to 0.69; P = 0.0008). Conclusion: TPE significantly reduced mortality in hospitalized patients with moderate-to-critical

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COVID-19. Plasma exchange therapy should be considered for patients with COVID-19.<sup>4</sup>

### DISADVANTAGES OF TPE

The exchange of large volumes of plasma may cause shifts of fluid that can lead to changes in blood pressure, cold hands and feet or breathlessness. Possible side effects during the treatment include dizziness, nausea or a feeling of cold.<sup>5</sup>

### PLASMA VOLUME CALCULATOR

To calculate blood plasma volume (PV), need the values of **hematocrit (Hct)** and **total blood volume (TBV)**:

$$PV = TBV \times (1 - Hct)$$

The plasma volume calculation is usually performed on the assumption that the patient's TBV is 70 mL per kg body weight for males and 65 mL per kg body weight for females.<sup>6</sup>

A review to assess the effect of TPE on the risk of mortality in patients with COVID-19-associated pneumonia, using three statistical procedures to rule out any threats to validity. Results Deaths were 6 (14%) in Group 2 and 14 (47%) in Group 1. We used an algorithm of structural equation modeling to summarize a large pool of potential confounders into a single score (called with the descriptive name "severity"). Disease severity was lower (Wilkinson rank-sum test  $p < 0.001$ ) among patients with COVID-19 undergoing TPE (median: -2.82; range: -5.18; 7.96) as compared to those not receiving TPE (median: -1.35; range: -3.89; 8.84), confirming that treatment assignment involved a selection bias of patients according to the severity of COVID-19 at hospital admission. The adjustment for confounding was carried out using severity as the covariate in Cox regression models. The univariate hazard ratio (HR) of 0.68 (95%CI: 0.26; 1.80;  $p = 0.441$ ) for TPE turned to 1.19 (95%CI: 0.43; 3.29;  $p = 0.741$ ) after adjusting for severity. **Conclusions** In this study sample, the lower mortality observed among patients receiving TPE was due to a lower severity of COVID-19 rather than the TPE effects.<sup>7</sup>

A review article on to evaluate the safety of TPE in adult patients with serious/life-threatening COVID-19 requiring ICU admission, and associated 28-day mortality. Serious and life threatening COVID-19 are defined as per published literature (please, refer to the full protocol, Additional file 1). Main outcomes Primary study end-point is 28-day mortality and safety of TPE in serious and/or life-threatening COVID-19. Safety will be evaluated by the documentation of any pertinent adverse and/or serious adverse effects related to TPE as per institutional, national and international guidelines. Secondary outcomes are: i) improvement in Sequential Organ Function Assessment (SOFA) score; ii) changes in inflammatory markers: serum C-reactive protein, lactate dehydrogenase, ferritin, d-dimers and interleukin-6; iii) days on mechanical ventilation and ICU length of stay.<sup>8</sup>

A review ondescribes the effect of therapeutic plasma exchange with 5% albumin as sole replacement solution for the management of Covid-19. A 74-year-old man was admitted for severe Covid-19 acute respiratory distress syndrome. Based on the growing body of evidence that cytokine release syndrome, and especially interleukin-6, plays a key role in critically ill Covid-19 patients, we decided to implement therapeutic plasma exchange as a rescue therapy. This case presents a proof-of-concept for the use of therapeutic plasma exchange with 5% albumin as sole replacement solution in a critically ill Covid-19 patient with cytokine release syndrome. Hence, we think that a further evaluation of risk-benefit balance of this therapy in severe cases of Covid-19 should rapidly be undertaken.<sup>9</sup>

A review COVID-19, caused by the novel coronavirus SARS-CoV-2, emerged in Wuhan, China, and has spread worldwide, resulting in over 73 million cases and more than 1 600 000 deaths as of December 2020. Although the disease is asymptomatic in most cases, some patients develop life-threatening disease characterized by acute respiratory



distress syndrome, sepsis, multisystem organ failure (MSOF), extrapulmonary manifestations, thromboembolic disease and associated cytokine release syndrome. The rationale for applying TPE early in the course of fulminant COVID-19 is the suppression of thrombusinflammation and amelioration of microangiopathy, thus preventing the ensuing MSOF. Although concerns still exist regarding its potential immunosuppressive effects and safety.<sup>10</sup>

A review on assessment of efficacy of therapeutic plasma exchange (TPE) following life-threatening COVID-19. This was an open-label, randomized clinical trial of ICU patients with life-threatening COVID-19 (positive RT-qPCR plus ARDS, sepsis, organ failure, hyperinflammation). Study was terminated after 87/120 patients enrolled. Standard treatment plus TPE (n = 43) versus standard treatment (n = 44), and stratified by PaO<sub>2</sub>/FiO<sub>2</sub> ratio (>150 vs. ≤150), were compared. Primary outcomes were 35-day mortality and TPE safety. Secondary outcomes were association between TPE and mortality, improvement in SOFA score, change in inflammatory biomarkers, days on mechanical ventilation (MV), and ICU Eighty-seven patients [median age 49 (IQR 34-63) years; 82.8% male] were randomized (44 standard care; 43 standard cares plus TPE). Days on MV (P = 0.007) and ICU LOS (P = 0.02) were lower in the TPE group. 35-Day mortality was non-significantly lower in the TPE group (20.9% vs. 34.1%; Kaplan-Meier, P = 0.582). TPE was associated with increased lymphocytes and ADAMTS-13 activity and decreased serum lactate, lactate dehydrogenase, ferritin, d-dimers and interleukin-6. Multivariable regression analysis provided several predictors of 35-day mortality: PaO<sub>2</sub>/FiO<sub>2</sub> ratio (HR, 0.98, 95% CI 0.96-1.00; P = 0.02); ADAMTS-13 activity (HR, 0.89, 95% CI 0.82-0.98; P = 0.01); pulmonary embolism (HR, 3.57, 95% CI 1.43-8.92; P = 0.007). Post-hoc analysis revealed a significant reduction in SOFA score for TPE patients (P < 0.05). In critically-ill COVID-19 patients, addition of TPE to standard ICU therapy was

associated with faster clinical recovery and no increased 35-day mortality.<sup>11</sup>

A review on investigated the effect of TPE on life-threatening COVID-19; presenting as ARDS plus multi-system organ failure and CRS. Materials and methods: We prospectively enrolled ten consecutive adult (ICU) subjects [7 males; median age: 51 interquartile range (IQR): 45.1-55.9 years old] with life-threatening COVID-19 infection. All had ARDS [PaO<sub>2</sub>/FiO<sub>2</sub> ratio: 110 (IQR): 95.5-135.5], septic shock, CRS and deteriorated within 24 h of ICU admission despite fluid resuscitation, antibiotics, hydroxychloroquine, ARDS-net and prone position mechanical ventilation. All received 5-7 TPE sessions (dosed as 1.0 to 1.5 plasma volumes). Results: All of the following significantly normalized (p < 0.05) following the TPE completion, when compared to baseline: Sequential Organ Function Assessment score, PaO<sub>2</sub>/FiO<sub>2</sub> ratio, levels of lymphocytes, total bilirubin, lactate dehydrogenase, ferritin, C-reactive protein and interleukin-6. Conclusion: TPE demonstrates a potential survival benefit and low risk in life-threatening COVID-19, albeit in a small pilot study.<sup>12</sup>

A review on severe acute respiratory syndrome coronavirus 2 infection can be severe and fatal due to cytokine storm. TPE potentially mitigates the harmful effects of such cytokines. We investigated the use of TPE, as rescue therapy, in patients with severe Coronavirus disease 2019 (COVID-19) infection. Results: A total of 95 patients were included, among whom 47% (n = 45) received TPE. Patients who received TPE had reductions in C-reactive protein (P = .002), ferritin (P < .001) and interleukin-6 (P = .013). After employing entropy-balancing matching method, those on TPE were also more likely to discontinue inotropes (72% vs 21%; P < .001). However, they were more likely to be associated with longer LOS (23 vs 14 days; P = .002) and longer days on ventilatory support (14 vs 8 days; P < .001). Despite marginal mortality benefit at 14-days (7.9% vs 24%; P = .071), there was no significant differences



in overall mortality (21% vs 31%;  $P = .315$ ) between the groups. Conclusions: TPE was effective in reducing inflammatory markers in patients with severe COVID-19 infection, however, further research is warranted.<sup>13</sup>

A review on to evaluate the therapeutic use of plasma exchange in COVID-19 patients compared to controls. Results: A total of 31 COVID-19 patients were included with an overall mean age of  $51 \pm 15$  years (range: 27-76 years); 90% ( $n=28$ ) were males, and 35% ( $n=11$ ) of the patients had TPE as a mode of treatment. The TPE group was associated with higher extubating rates than the non-TPE cohort (73% versus 20%;  $p=0.018$ ). Additionally, patients on TPE had a lower 14 days (0 versus 35%;  $p=0.033$ ) and 28 days (0 versus 35%;  $p=0.033$ ) post plasma exchange mortality compared to patients not on TPE. However, all-cause mortality was only marginally lower in the TPE group compared to the non-TPE group (9.1% versus 45%;  $p=0.055$ ; power=66%). Laboratory and ventilatory parameters also improved post TPE ( $n = 11$ ). Conclusions: The use of TPE in severe COVID-19 patients has been associated with improved outcomes, however, randomized controlled clinical trials are warranted to draw final, conclusive findings.<sup>14</sup>

A review on the 5 months since initial reports of COVID-19 came to light, the death toll due to SARS-CoV-2 has rapidly increased. The morbidity and mortality of the infection varies based upon patient age, comorbid conditions, viral load, and the availability of effective treatments. Findings from limited autopsies, clinical observations, and laboratory data suggest that high cytokine levels and a procoagulant state can precipitate acute respiratory distress syndrome and multi-organ dysfunction syndrome in critically ill patients. Therapeutic plasma exchange (TPE) merits consideration in the treatment of critically ill COVID-19 patients and is an avenue for clinical trials to pursue. If efficacious, faster recovery of patients may lead to shorter intensive care unit stays and less time on mechanical ventilation. Herein,

we briefly discuss some of the various approaches currently being investigated for the treatment of SARS-CoV-2 with a focus on potential benefits of TPE for selected critically ill patients.<sup>15</sup>

A review on although most patients with severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) experience respiratory manifestations, multi-organ dysfunction is frequent. Almost 20% of hospitalized patients with SARS-CoV-2 infection develop AKI. The pathophysiology of AKI is a result of both the direct and indirect effects of SARS-CoV-2 infection, including systemic inflammatory responses, the activation of the RAAS, and endothelial and coagulative dysfunction. Underlying SARS-CoV-2 infection-associated AKI, an immunological hyper-response with an unbalanced innate and adaptive response defined as a "cytokine storm" has emerged. Numerous agents have been tested in an effort to mitigate the cytokine storm, and a range of extracorporeal cytokine removal techniques have been proposed as potential therapeutic options.<sup>16</sup>

A study is intended to compare the outcomes of COVID-19 patients with CRS treated with TPE and standard care to their counterparts receiving SC alone. Results: After CC matching, the study cohort had a mean age of 55.41 (range  $56.41 \pm 11.56$  in TP+SC and  $54.42 \pm 8.94$  in SC alone;  $p=0.22$ ). There were 25.95% males and 74.05% females in both groups. The mean time from first day of illness to hospitalization was  $6.53 \pm 2.18$  days. The majority of patients with CRS had comorbid conditions (75.9%). Diabetes mellitus was the most common comorbidity (40.1%), followed by hypertension (25.3%), and chronic kidney disease (21%). Notable reduction in some inflammatory markers ( $p < 0.0001$ ) was observed in the group that received TPE+SC. Moreover, the patients in the plasmapheresis plus standard care group required relatively less mechanical ventilation as compared to the group receiving SC alone (46.9% vs 58.1%, respectively;  $p > 0.05$ ). The rate of extubating in

the TP+SC group vs SC alone was 60.5% vs 44.7%, respectively ( $p>0.05$ ). Conclusion: For this particular group of matched patients with COVID-19-induced CRS, TPE+SC was linked with relatively better overall survival, early extubating, and earlier discharge compared to SC alone. As these results were not statistically significant, multi-centered randomized control trials are needed to further elaborate the role of therapeutic plasmapheresis in COVID-19 induced CRS.<sup>17</sup>

## CONCLUSION

At the current scenario though "COVID-19" word not creating a panic effect still when there is secondary or associated disorder, it's very horrible and unpredictable occurrence of symptoms as well as outcome. That's why we, authors tried to keep the review concept to the readers regarding the subject especially for Pneumonia or any other respiratory disorder cases. Hope the readers will get good and clear concept regarding the motile effect of this condition,

## LIST OF ABBREVIATIONS

- TPE-Therapeutic Plasma Exchange
- ICU-intensive care unit
- TBV-Total Blood Volume
- SARS-CoV-2-Severe Acute Respiratory Syndrome Coronavirus 2
- LOS-length of stay
- AKI-Acute Kidney Injury
- R A A S - R e n i n - a n g i o t e n s i n - aldosterone system
- CRS-cytokine release syndrome

CONFLICT OF INTEREST-Have no conflict of interest relevant to this research study.

SOURCE OF FUNDING-Self funding.Have not received any financial assistance from the esteemed institution.

ETHICAL CLEARANCE-Ethical clearance has been obtained from the concerned authority.

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