ASSESSMENT OF NURSES KNOWLEDGE ABOUT CARDIOPULMONARY RESUSCITATION IN INTENSIVE CARE UNITS AND EMERGENCY DEPARTMENT IN IRAQ

BY

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ETHICS STATEMENT

The thesis entitled “Assessment of Nurses Knowledge about Cardiopulmonary Resuscitation in Intensive Care Units and Emergency Department in Iraq” which was prepared and presented as a thesis, was written by myself and in accordance with the scientific, academic rules and ethical conduct. The idea/hypothesis of my thesis solely belongs to my supervisor and to me. The research pertaining to the thesis was conducted by myself and therefore, all of the used sentences and interpretations within the work belongs to me.

I declare the aforementioned issues to be correct.

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ABSTRACT

ASSESSMENT OF NURSES KNOWLEDGE ABOUT CARDIOPULMONARY RESUSCITATION IN INTENSIVE CARE UNITS AND EMERGENCY DEPARTMENT IN IRAQ

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Master of Science in Nursing

Advisor: Asst. Prof. Dr. Ayşe Özge DENİZ

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Cardiopulmonary resuscitation (CPR) is a crucial life-saving procedure used in emergency situations where an individual's heartbeat or breathing has stopped. Therefore, it is important that CPR be initiated immediately by people with adequate knowledge and skills. It is vital that nurses working in services such as emergency and intensive care, where the need for emergency resuscitation is high, have sufficient knowledge about CPR and manage emergency situations effectively. In this context, the aim of this study was to evaluate the level of knowledge of nurses working in emergency and intensive care units about CPR. The study was a descriptive cross-sectional study, and the population consisted of nurses working in the intensive care and emergency departments of the Iraqi Nasiriyah Shatra general hospital. The study was conducted with 190 nurses between November 17 and December 10, 2023. A questionnaire form regarding sociodemographic data and a questionnaire form measuring the level of knowledge of nurses about cardiopulmonary resuscitation were used to collect the data. Number, percentage distributions, mean, standard deviation, one-way variance, and an independent sample t test were used to analyze the data. It was determined that 28.9% of the nurses participating in the study were between 26 and 30 years old, 58.4% were female, 53.2% resided in the province, and 67.9% were married. It was also determined that 42.1% had a bachelor's degree in nursing, 37.9% had 1–5 years of service in nursing, 55.3% worked in the emergency department, 55.8% had never received CPR training, and 35.8% performed CPR every day. It was determined that the level of CPR knowledge increased as the level of education

increased, and the level of CPR knowledge of nurses who worked in the emergency department and practiced CPR on a daily basis was higher. According to the results of the study, it is recommended to provide training to increase the knowledge level of nurses on CPR to individual factors such as nurses' education level, working area, and practical experience when designing training programs.

2024, 63 pages

Keywords: CPR, Knowledge level, Nurse, Iraq

ÖZET

IRAK'TA YOĞUN BAKIM ÜNITESI VE ACIL SERVISTE ÇALIŞAN HEMŞIRELERIN KARDIYOPULMONER RESÜSITASYON BILGI DÜZEYLERININ DEĞERLENDIRMESI

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Kardiyopulmoner resüsitasyon (CPR), bireyin kalp atışı veya solunumunun durduğu acil durumlarda kullanılan hayati öneme sahip bir prosedürdür. Bu nedenle CPR'ın yeterli bilgi ve beceriye sahip kişiler tarafından hemen başlatılması önemlidir. Özellikle acil resüsitasyon ihtiyacının yüksek olduğu acil ve yoğun bakım gibi servislerde çalışan hemşirelerin CPR konusunda yeterli bilgiye sahip olmaları ve acil durumları etkin bir şekilde yönetebilmeleri hayati önem taşımaktadır. Bu bağlamda, bu çalışmanın amacı, acil ve yoğun bakım servislerinde çalışan hemşirelerin CPR konusundaki bilgi düzeylerini değerlendirmektir. Çalışma tanımlayıcı kesitsel bir çalışma olup, evrenini Irak Nasiriyah Shatra genel hastanesinin yoğun bakım ve acil servislerinde çalışan hemşireler oluşturmuştur. Çalışma 17 Kasım - 10 Aralık 2023 tarihleri arasında 190 hemşire ile yürütülmüştür. Araştırma verilerinin toplanmasında sosyodemografik verilere ilişkin anket formu ve hemşirelerin kardiyopulmoner resüsitasyon konusundaki bilgi düzeyini ölçen anket formu kullanılmıştır. Verilerin analizinde sayı, yüzde dağılımları, ortalama, standart sapma, tek yönlü varyans ve bağımsız örneklem t testi kullanılmıştır. Araştırmaya katılan hemşirelerin %28,9'unun 26-30 yaş aralığında olduğu, %58,4'ünün kadın, %53,2'si şehir merkezinde ikamet ettiği ve %67,9'unun evli olduğu belirlenmiştir. Ayrıca %42,1'inin hemşirelik lisans mezunu olduğu, %37,9'unun hemşirelikte 1-5 yıl aralığında hizmeti olduğu, %55,3'ünün acil serviste görev yaptığı, %55,8'inin hiç CPR eğitimi almadığı ve %35,8'inin her gün CPR uyguladığı belirlenmiştir. Eğitim düzeyi arttıkça CPR bilgi düzeyinin de arttığı, acil serviste çalışan ve her gün CPR uygulayan hemşirelerin CPR bilgi düzeyinin daha yüksek olduğu belirlenmiştir. Çalışma sonuçlarına göre, eğitim programları tasarlanırken hemşirelerin

eğitim düzeyi, çalışma alanı, uygulama deneyimi gibi bireysel faktörlerin yanı sıra hemşirelerin CPR konusunda bilgi düzeyini artırmaya yönelik eğitimlerin verilmesi önerilmektedir.

2024, 63 sayfa

Anahtar Kelimeler: CPR, Bilgi Düzeyi, Hemşire, Irak

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Wasan Ghazi Kadhim KADHIM

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INDEX OF SYMBOLS

%	Percentage
+	Plus
<	less than
=	Equal
>	More than
P	Probability
α	Alpha
β	Beta

LIST OF ABBREVIATIONS

ABG	Arterial blood gases
ACLS	Advanced cardiac life support
AEDs	Automated external defibrillators
AHA	American heart association
ALS	Advanced life support
BLS	Basic life support
BUN	Blood urea nitrogen
CDC	Centers for disease control
CPA	Care programme approach
CPR	Cardiopulmonary resuscitation
CPR-D	CPR and early defibrillation
df	Degree freedom
DNR	Do not resuscitate
ECC	Emergency cardiovascular care
EMS	Emergency medical services
ERC	European resuscitation council
ETT	Endotracheal tube
ICU	Intensive care unit
IHCA	In-hospital cardiac arrest
IHD	Ischemic heart disease
ILCOR	International liaison committee on resuscitation
NAS	National academy of sciences
NRC	National research council
OHCA	Out-of-hospital cardiac arrest
PALS	Paediatric advanced life support
ROSC	Restoration of spontaneous circulation
SCA	Sudden cardiac arrest
VF	Ventricular fibrillation

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1. INTRODUCTION

Cardiac arrest is a critical medical emergency characterized by the cessation of cardiac mechanical activity. This results in the heart's inability to pump blood and oxygen to vital organs, making it a highly time-sensitive situation. In such cases, individuals who are unresponsive and not breathing normally are presumed to be in cardiac arrest. Recognizing and responding promptly to these situations is crucial for initiating life-saving interventions (Lund-Kordahl 2021, Roger *et al.* 2011). Considering that cardiac arrest has the potential to induce irreversible brain damage in a matter of minutes, it is estimated that 15–20% of all fatalities are attributable to this serious health issue. Sudden cardiac death is a significant contributor to cardiovascular morbidity and mortality in both developed and developing nations. An estimated three million fatalities occur annually on a global scale, with survival rates falling below 8% (Ihunanya *et al.* 2020). The occurrence of sudden cardiac arrest outside the hospital varies from 20 to 140 cases per 100,000 people globally, with a survival rate ranging between 2 and 11%. In the United States and Canada, the incidence is approximately 50–55 cases per 100,000 people, with more than 60% of reported cases attributed to coronary heart disease (Aranzábal-Alegría *et al.* 2017).

The International Classification of Diseases identified 72 cases of natural abrupt cardiac death (without a history) in Babil Province, Iraq. 60% of the cases under examination were ischemic heart diseases, followed by myocardiopathy diseases (10%), unspecified cerebrovascular diseases (5%), and ischemic heart diseases (20%). 53% of cases of ischemic heart disease (IHD) affected individuals aged 46 to 50. In contrast, approximately 55% of cerebrovascular maladies occurred in individuals between the ages of 41 and 45. Ischemic heart diseases (77%) and unspecified disorders of the circulatory system (80%) accounted for the greatest proportion of males affected (Al Jothery 2017).

Additionally, cardiac arrest revealed that cardiopulmonary arrest was the cause of 17.8 million deaths worldwide each year, and Al Nasri and Al Bulushi 2020 predict that number will rise to 23 million by 2030.

Survival in the aftermath of cardiac arrest is reliant on a multitude of factors, one of which is the availability of trained personnel capable of administering CPR (Moepeng 2017).

CPR is an internationally recognized medical intervention that aims to sustain sufficient blood flow to critical organs and the brain through the use of chest compressions and artificial ventilation. It has been demonstrated that the implementation of cardiopulmonary resuscitation by suitably trained medical personnel can decrease the occurrence of cardiac mortality and related fatalities in the hospital (Rajeswaran *et al.* 2018).

In spite of training programs that teach efficient CPR procedures, a high percentage of practitioners lack the necessary skills to do CPR. Lack of knowledge about CPR impairs staff performance throughout the procedure, which results in subpar CPR, which has been shown to have outcomes that are comparable to victims receiving no CPR (Al Nasri and Al Bulushi 2020).

A nurse plays a crucial role in the management of cardiac arrests in hospitals across the globe. Usually, it is the nurse who discovers the cardiac arrest, since she is at the forefront of the patient's care from the moment the acute event occurs to the moment when the patient is discharged. Moreover, nurses play an integral part in the resuscitation process, which requires a great deal of knowledge and skills that have to be applied efficiently and timely in a short period of time (Daniele 2012).

Therefore, it is imperative that nurses possess knowledge of the principles and techniques underlying CPR, as the ability to deliver effective CPR can extend the patient's chances of survival and facilitate their recovery. Therefore, the proficiency of nurses in CPR is an essential determinant of favorable patient outcomes in the event of cardiac arrest (Sankar *et al.* 2011).

Based on all these reasons, the main aim of this study was to evaluate the level of CPR knowledge of nurses working in the emergency department and intensive care unit.

1.1 Objectives of study

This study was conducted to evaluate the level of CPR knowledge of nurses working in the emergency department and intensive care unit.

1.2 Research question

1. What is the nurses' knowledge about CPR?
2. Is there a correlation between the proficiency of nurses in CPR and demographic variables?

1.3 Limitation of the study

The findings of the study are limited to the nurses working in the emergency department and intensive care units in the Iraqi Nasiriyah hospital where the study was conducted. Therefore, it cannot be generalized to all nurses.

2. LITERATURE REVIEW

2.1 Cardiac arrest

In the world, cardiac arrest is the leading cause of sudden death. Annually, there are about 6 million cardiac arrest-related sudden deaths; coronary artery diseases are to blame for 60–70% of these deaths, and other heart conditions are to blame for 10%. The remaining 25% of deaths are due to noncardiographic causes of cardiac arrest such as trauma, respiratory arrest, chokes, electrocutions, and drowning (Podrid and Cheng 2016).

Cardiac arrest events are commonly classified into two categories: out-of-hospital cardiac arrest (OHCA) and in-hospital cardiac arrest (IHCA). The primary distinctions between IHCA and OHCA involve more medical comorbidities, increased witnessed arrests, and a higher presence of professional first responders in IHCA. Although resuscitation guidelines are generally similar for IHCA and OHCA, these differences necessitate considering them as distinct populations (Moskowitz *et al.* 2018).

In the Western world, cardiac disease, particularly acute ischemia resulting from coronary artery disease, is the most frequent cause of OHCA, accounting for 70%–85% of cases (Bobrow *et al.* 2010, Rea *et al.* 2010). Other cardiac etiologies include arrhythmias, heart failure, valve disease, and congenital heart disease. Non-cardiac causes encompass strangulation, intracerebral events, trauma, drowning, intoxication, asphyxia, electrocution, and primary respiratory arrests (Lund-Kordahl 2021).

2.2 Cardiopulmonary resuscitation (CPR)

CPR is a vital medical intervention that combines rescue breathing with chest compressions. The aim is to maintain oxygenated blood flow to the brain, preserving brain function until additional measures can be taken to restore normal spontaneous blood circulation and breathing in an individual experiencing cardiac arrest. CPR is a

fundamental element of basic life support and serves as the primary response in cases of cardiac arrest, preceding defibrillation, and advanced life support measures (Ihunanya *et al.* 2020). Resuscitation, as employed within healthcare facilities and hospitals, pertains to expeditious interventions designed to avert fatalities and optimize the likelihood of human survival. A healthcare professional's prompt actions may determine an individual's survival or demise. It is thus essential that health care professionals receive resuscitation training courses that are consistent, current, and efficacious (Ahmed *et al.* 2017).

CPR measures can vary based on the patient's needs and the nurse's knowledge of administering the treatment. Understanding both the appropriate actions and what to avoid in an emergency situation is crucial. Misapplication of CPR measures may result in serious complications, including broken ribs, ineffective lung inflation, and cardiac output issues that can lead to brain damage or death (Al-Janabi and Al-Ani 2014).

When sudden death is imminent, CPR represents the last chance for survival. It involves external cardiac compression and mouth-to-mouth resuscitation, aiming to maintain circulation until normal circulation and ventilation can be restored through definitive therapy. The essential skills required for performing CPR should be taught to all health professionals (Christian *et al.* 2017).

The primary objective of CPR is to prevent additional damage to the individual who has collapsed and is administered as the initial aid. Appropriate CPR techniques have the potential to alleviate suffering, accelerate subsequent recovery, avert irreversible disability, and even preserve life. The initial minutes after an injury are referred to as the "golden time." Numerous complications and events that transpire during this period, if left unaddressed, can transform a minor injury into a fatality. To reduce mortality and morbidity, it is critical to act and react during the golden period (Nassar and Kerber 2017). According to the American Heart Association's 2010 CPR guidelines, good-quality chest compressions should be the first step in performing CPR. After that, the focus should be on the airway and breathing. The goal is not to look, listen, or feel.

Rather, it is an action, not an assessment, and one must push the chest at least 2 inches deep. At this rate, 30 compressions should take about 18 seconds (Bonnes *et al.* 2016).

The significance of basic life support training in nursing education is increasing. Critical life-saving training in basic life support can literally mean the difference between life and death for a victim. In the event of cardiac arrest, nurses must possess the ability to assess the situation and administer basic life support, which consists of sustaining the victim's respiration and circulation until the arrival of emergency or advanced life support services. Consistent training and revisions in resuscitation should be provided to all nurses entrusted with patient care. It is incumbent upon all registered nurses to maintain their proficiency in resuscitation techniques (Berg *et al.* 2016).

Educational reform is essential to meet the challenges of the current healthcare landscape. Learning objectives should center on achieving optimal practice outcomes and emphasize the actions healthcare providers are expected to take after completing educational activities. Regulatory bodies and consumers hold healthcare professionals accountable for delivering high-quality and safe patient care. Educational programs should equip nurses with the skills and knowledge necessary to meet these expectations. The emerging generation of nurses must be nurtured to deliver timely and appropriate essential care to their patients, requiring ongoing training and practice (Perkins *et al.* 2016).

2.2.1 History of CPR

The development of modern CPR application techniques occurred in stages throughout history. 1960 marked the inception of the term "closed cardiac massage." During this time, Kouwenhoven and his associates successfully implemented cardiovascular massage and artificial respiration. The fundamentals and standards of CPR were compiled by the National Academy of Sciences and the National Research Council in the USA (NAS-NRC) in 1966, drawing knowledge from numerous studies. Specifically, these encompassed airway patency, breathing restoration, and circulation. The definitive and final therapy came after the initial measures (Riggs *et al.* 2019).

In the approximately 60 years between 1900 and 1960, advancements toward the establishment of contemporary CPR were comparatively gradual. However, things began to attain a certain degree of momentum in the early 1980s. A physician by the name of Friedrich Maass initiated the practice of conducting chest compressions on humans with notable success in 1904. Additionally, Dr. George Crile reported success with the combination of external chest compressions and closed-chest cardiac massage. Doctors Peter Safar, James Elam, and Archer S. Gordon initiated efforts in the 1950s to refine contemporary CPR techniques, which encompassed the creation and implementation of the rescue breathing method. In 1959, Dr. Elam authored an instructional pamphlet titled "Rescue Breathing," which subsequently achieved nationwide distribution. The advent of enhanced publication techniques facilitated the bulk training of individuals. Prominent organizations, including the National Academy of Science, the Medical Society of New York, and the American Society of Anesthesiologists, adopted the rescue breathing technique gradually but certainly. The Red Cross subsequently adopted a similar course of action in 1960. During this juncture, CPR gained widespread acceptance as the standard approach for managing sudden cardiac arrest and drowning (Rogers 2019).

Safar defined the integration of both techniques as CPR in 1961. Throughout the duration of the Vietnam War, the United States Army first introduced CPR to the general public. Subsequently, in 1973, the American Heart Association (AHA) and the American Red Cross launched a massive education campaign to promote this technique among the American public. ILCOR (International Liaison Committee on Resuscitation) was established in 1992; the ERC (European Resuscitation Council) is the European representative body. The European Council modifies its CPR guidelines in response to the assessment of new scientific publications that occur approximately every five years (FM CU 2021).

2.2.2 Prevalence of CPR

The current global survival rate of less than 10% demonstrates that OHCA is a serious public health concern (Yan *et al.* 2020). Survival is potentially enhanced for individuals

who are untrained in CPR but experience an OHCA, according to the findings of Song *et al.* (2018). Nevertheless, layperson CPR rates continue to be inadequate in numerous nations (Tanaka *et al.* 2018, Gräsner *et al.* 2020).

Insufficient knowledge and skills are identified as key barriers that hinder laypeople's willingness to engage in resuscitation efforts (Ong *et al.* 2013, Chen *et al.* 2017). Internationally, it is widely acknowledged that providing effective CPR training to laypeople is crucial to augmenting the pool of individuals ready and capable of offering assistance in real-life emergencies, thereby enhancing survival rates after OHCA (Greif *et al.* 2015). To effectively guide and prioritize training interventions within a community, it is imperative to comprehend the current practices related to CPR education. The barriers to resuscitation education, the prevalence rates of CPR training, and the perceptions of the general public are all factors that can be ascertained through public surveys. These sources furnish pertinent data that can be utilized to formulate and direct CPR education initiatives and campaigns (Moon *et al.* 2019).

Providing CPR education has the potential to enhance the community's capacity to perform CPR, thereby decreasing mortality rates and increasing the chances of survival when administered promptly. The evolution of CPR education has shifted from hospital-centric training to community-oriented learning, emphasizing active community involvement. Improving CPR knowledge among the general public not only benefits individuals experiencing heart attacks but also contributes to the survival of heart attack victims through effective CPR implementation (Yasin *et al.* 2021).

On a global scale, the median percentage of individuals who had not had any training yet were certified in cardiopulmonary resuscitation was forty percent. Where the median percentage was two times higher in countries with high incomes than it was in countries with upper middle incomes. An assortment of survey methodologies and reporting patterns were employed in the studies. Frequently, crucial methodological aspects were not described. In summary, the prevalence of CPR training among the general public has been the subject of few studies. Unknown are the rates of resuscitation training in the overwhelming majority of nations (Birkun *et al.* 2021).

2.2.3 Indications of CPR

Heart (cardiac) arrest and respiratory arrest are the main indications for CPR.

1. Circulation (cardiac) arrest. When a person undergoes cardiac arrest, the blood circulation ceases, and oxygen and nutrients are not supplied to their vital organs. An agonal type of breathing failure can occur at this time, and it must be distinguished from adequate breathing in order to avoid making mistakes when providing assistance. The presence of arrhythmias (ventricular fibrillation, ventricular tachycardia, and asystole) can lead to cardiac arrest (Singer *et al.* 2015).

2. Respiratory arrest. Asphyxiation, lightning, stroke, comas of various origins, drug overdose, falling foreign objects into the airway, drowning, inhaling smoke, asphyxiation, and falling foreign objects into the airway are among the reasons for death. The heart and lungs continue to supply oxygen to the brain for a few minutes after primary respiratory arrest. Whenever the victim is in respiratory arrest or unable to breathe properly, breathing resuscitation is needed to prevent heart failure (Nakstad *et al.* 2020).

It is very important to start CPR before figuring out the rhythm and keep it up while the defibrillator is being used and charged. This is true even though quick defibrillation has been shown to improve survival for ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT) rhythms (Chan *et al.* 2008). After a defibrillatory shock, CPR should be promptly resumed until a pulsatile state is restored, as studies indicate that pauses in CPR before defibrillation can lead to lower rates of defibrillation success and patient recovery (Edelson *et al.* 2006).

According to a study in Seattle, 84% of patients who suffered out-of-hospital cardiac arrests were able to regain a pulse when they were defibrillated. Defibrillation is generally more effective when it is delivered as quickly as possible (Wik *et al.* 2005).

The American College of Surgeons, the American College of Emergency Physicians, and the National Association of Emergency Medical Physicians have all published several guidelines on withholding or terminating resuscitation in pediatric out-of-hospital traumatic cardiopulmonary arrest (ACSCT 2014). Recommendations include the following:

- Patients with blunt trauma or penetrating injuries who are not expected to survive should be considered for resuscitation.
- The resuscitation of arrested patients without traumatic injuries should be initiated according to standard practice.
- Resuscitation is required for victims of lightning strikes and drownings who have significant hypothermia.
- CPR should be performed on any child showing signs of life after traumatic CPR; the airway should be managed, and intravenous and intraosseous lines should be placed on your child as soon as possible.
- There may be a longer period of hypoxia if the trauma was not witnessed, and it may be appropriate to limit CPR to 30 minutes or less in these circumstances.
- Resuscitation can be initiated and maintained until hospital arrival, regardless of the circumstances or timing of the traumatic event.
- State protocols should include guidance on terminating resuscitation in children.

2.2.4 Associated complications with CPR

Aspiration pneumonia in resuscitated patients is often associated with regurgitation and aspiration of gastric contents. As a result of the importance of compressing the chest sufficiently to allow sufficient blood flow, costochondral separation and fractured ribs are often unavoidable. It has been demonstrated that fractures in children are quite rare due to the flexibility of the chest wall. There is no clear evidence that bone marrow emboli to the lungs contribute to mortality after external cardiac compression. A lung injury is rare, but pneumothorax may develop after a penetrating rib fracture. When a patient has recovered spontaneous circulation after prolonged CPR but has become difficult to ventilate or is hypoxic and abruptly rearrests, tension pneumothorax should

be considered. In the majority of cases, compression does not result in serious myocardial injury, with the possible exception of aneurysms. The rescuer should not be deterred from performing CPR for this reason (Atkins *et al.* 2022).

Hepatic laceration is an uncommon but potentially serious (and occasionally fatal) complication that frequently results from abdominal compression below the sternum. A rare complication is rupture of the stomach, especially when the stomach is distended with air. Extremely uncommon is a delayed rupture of the spleen (Hayek *et al.* 2020).

2.2.5 Post resuscitative care

Restoration of spontaneous circulation (ROSC) is an intermediate objective in resuscitation, with the ultimate goal being survival to hospital discharge with good neurological function, an outcome achieved by only a minority of patients who achieve ROSC. To enhance the likelihood of a favorable outcome, clinicians must deliver effective supportive care, including the management of blood pressure, temperature, and cardiac rhythm, along with the treatment of underlying conditions, especially acute coronary syndromes (Nolan *et al.* 2021).

The goal of post-resuscitative care is to mitigate reperfusion injuries after the period of ischemia. Post-resuscitative care begins immediately after spontaneous circulation has been established. During ventilation, a reading of 35 to 40 mm Hg should be achieved. Oxygen administration should be titrated down to a SpO2 of 94% to prevent hyperoxic damage to the lungs. In addition to fluid boluses, vasopressor infusions should be administered if tolerated (Pothiawala 2017).

After resuscitation, the laboratory conducts a comprehensive assessment of the patient's condition, including an examination of electrolytes, glucose, BUN (blood urea nitrogen), creatinine, cardiac markers, and arterial blood gases (ABG). When CPR causes skeletal muscle injury, creatine kinase levels are typically higher; troponins, which are difficult to change with defibrillation or CPR, are preferred. Ensure that

arterial PaO2 levels remain within the acceptable range of 80 to 100 mm Hg. Hematocrit and glucose levels should be maintained within the normal range of 140 to 180 mg/dL (7.7 to 9.9 mmol/L and 30%, respectively) if cardiac etiology is suspected; electrolytes, especially potassium, should be within the normal range (Schlesinger 2021).

2.3 Pathophysiology of CPR

The goal of CPR is to oxygenate the blood and sustain cardiac output in order to preserve vital organs in the event of cardiac arrest. In order to transport oxygen to the tissues, blood circulation and oxygenation are necessary. Various mechanisms are employed to achieve a pressure gradient between the arterial and venous vascular beds during CPR. Brain damage may occur after approximately four minutes without blood flow, becoming irreversible after about seven minutes. Generally, CPR is effective only if initiated within seven minutes of blood flow cessation. In near-drownings, when the heart is rapidly unable to maintain a normal rhythm and when the body temperature is low, the brain can survive longer. After cardiac arrest, effective CPR delays brain stem death, facilitates sufficient oxygen delivery to the brain, and keeps the heart open to defibrillation (Kenny 2015).

A major cause of death in both prehospital and hospital settings is sudden cardiac arrest. The majority of patients are not successfully resuscitated after cardiac arrest (William *et al.* 2016). According to published studies, cardiac arrest survival rates are grim, ranging from 1% to 20% in non-traumatic out-of-hospital cardiac arrests and 40% in hospital cardiac arrests (Yang *et al.* 2019). There are 10% to 50% of these who have poor neurological function (Inoue *et al.* 2020).

To successfully resuscitate a patient, blood flow must be reestablished with adequate aortic pressure as the primary step. In order to minimize morbidity and mortality after cardiac arrest, it is imperative that we understand the intricate physiology of cardiocerebral perfusion during CPR. In addition to enhancing vital organ flow, it is often insufficient to fully restore life after cardiac arrest by itself. There are significant

knowledge gaps and unmet needs within resuscitation science that prevent us from consistently achieving complete recovery from cardiac arrest. The most commonly used CPR method, closed-chest cardiac massage, has remained unchanged for over half a century. In order to address these gaps, a greater blood flow needs to be generated than that generated by conventional closed-chest cardiac massage (Li *et al.* 2021).

The second is the requirement for CPR-improving instruments (Diao *et al.* 2016). Furthermore, it is crucial to mitigate the risk of brain damage that may result from the concurrent application of venous and arterial pressure compression pulses that are directed at the brain during chest compression. Preventing reperfusion injury during the initial seconds and minutes following reperfusion is the fourth objective, particularly following extended periods of no flow (Morgan 2017). Post-resuscitation care, which falls outside the purview of this review, constitutes the fifth significant domain in which unfulfilled clinical requirements exist (West *et al.* 2022).

2.4 Physiology of resuscitation maneuvers and their techniques

To deliver high-quality CPR, it is essential to perform specific techniques, including chest compressions, ventilations, and defibrillations, following the recommendations and evidence-based practices established by scientific research.

2.4.1 Chest compressions

CPR's chest compressions are a crucial part of delivering oxygenated blood to the heart and brain. The purpose of chest compressions is to provide oxygenated blood to the heart and brain. Both direct cardiac massage and thoracic pumps are employed to accomplish this goal. All patients who suffer a cardiac arrest are eligible. Whenever a healthcare professional encounters an unresponsive patient without a clear pulse or normal breathing, compressions may be initiated without a doctor's order (Kleinman *et al.* 2015).

The two primary hypotheses explaining how chest compressions maintain blood flow to vital organs are the external cardiac massage and the thoracic pump models.

- **The cardiac massage model**

As a result of the force exerted by the sternum pressed against the thoracic spine, the blood that is expelled from the heart will enter the circulatory system, ultimately perfusing the vital organs (Moepeng 2017).

- **In the thoracic pump model**

Theoretically, when the chest is compressed, the pressure within the thoracic cavity is intermittently increased; the vena cava, the heart, and the aorta will all be subjected to the same amount of pressure as the chest. As a consequence, arterial and venous vasculature pressures are elevated, leading to increased blood flow to the critical organs (Moepeng 2017).

2.4.2 Defibrillation

Cardiac defibrillation involves giving a transthoracic electrical current to people who have ventricular dysrhythmias, especially ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), which can be life-threatening. Advanced Cardiac Life Support (ACLS) guidelines address pulseless VT and VF in a similar manner. As per the Centers for Disease Control and Prevention (CDC), heart disease is responsible for 610,000 annual deaths in the United States, maintaining its status as the leading cause of death in both genders. About half of these sudden deaths occur outside the hospital, with nearly three-quarters happening at home, half of which are unwitnessed. In adults, VF is the most common cause of sudden cardiac arrest (Wang and Brooks 2018).

An effective method for treating ventricular fibrillation (VF) is electrical defibrillation, which is most effective when performed as soon as possible after its onset. Each minute

of delay in defibrillation decreases effectiveness by almost 10%. Only 10.8% of adult victims of nontraumatic cardiac arrest survive hospital discharge after receiving resuscitation attempts by emergency medical services. By comparison, adult cardiac arrest patients treated in a hospital can expect a survival rate of up to 25.5% after receiving defibrillation sooner during the episode (Srinivasan and Schilling 2018, Pacheco *et al.* 2018).

First responders and, in some cases, the general public can now provide early defibrillation to victims of sudden cardiac arrest with automated external defibrillators (AEDs). Defibrillators interpret the EKG rhythm automatically, determine if a shockable rhythm is present, automatically charge themselves, and provide verbal prompts to the patient so they can successfully defibrillate the patient (El-Battrawy *et al.* 2018, Goyal *et al.* 2023).

2.4.3 Ventilation and support

Ventilation and airway management are critical elements of advanced cardiac life support (ACLS). During CPR, airway management ensures adequate ventilation and oxygenation, prevents hypoxic impairment, and improves the prognosis for neurological and overall survival. Recommendations regarding the use of advanced airway devices, the necessity of training, and the acquisition of a second (backup) strategy for advanced airway techniques were revised in the 2019 amended guidelines. Additionally, capnography was underscored in the guidelines (Panchal *et al.* 2019).

The Focused ACLS Guidelines for 2019 and 2020 recommend the use of bag-mask ventilation or advanced airway strategies for adult cardiac arrest while minimizing the interruption of chest compressions (Panchal *et al.* 2020).

During the 2019 and 2020 ACLS guidelines updates, it was stressed that if bag mask ventilation is adequate, either advanced airway devices can be placed after two rounds of chest compressions have been completed. Using either a supraglottic airway (SGA)

or an endotracheal tube (ETT), rescue breathing has been simplified to 10 breaths per minute, or every 6 seconds. SGAs are preferred in situations where clinicians lack proper training in airway management or when intubation success rates are low (Panchal *et al.* 2020). The international consensus on CPR and emergency cardiovascular care (ECC) published an updated summary of advanced life support in 2021. This revision encompasses airway management during drowning, barrier devices, and CPR performed in a prone position (Wyckoff *et al.* 2021).

2.5 The CPR procedure

CPR is an urgent, hands-on intervention performed on a person experiencing cardiac arrest to restore respiration and a heartbeat. Mitigation factors for cardiac arrest frequently include myocardial infarction and imminent drowning. CPR consists of cardiac compressions and, in certain instances, rescue ventilation (also known as "mouth-to-mouth"). These methods can maintain circulation to the brain and other vital organs until medical assistance arrives. A brain injury can develop in a matter of minutes when oxygen-rich blood is unable to reach the brain (Brouhard and Menna 2022).

2.5.1 Equipment and drugs

Resuscitation equipment consists of everything from consumables and medications to access to electrical power. Emergency equipment is documented in emergency/crush charts. For expedited access, the schematics ought to be adequately supplied and arranged. Due to the absence of resuscitation equipment standardization, medical facilities ought to furnish inventories specifying the essential drugs and equipment that must be carried in arrest trolleys (Moepeng 2017). The CPR apparatus consists of the following (Boergers and Bowman 2017):

- Mask with a reservoir bag for oxygen
- A pocket mask with a one-way valve

- Electrodes and a razor attached to an Automated External Defibrillator (AED).
- Needles and syringes
- Suitable oxygen cylinder (able to deliver high-flow oxygen for a minimum of 30 minutes)
- Adrenaline/Epinephrine
- Tape
- Hand gloves
- Box for sharps
- The scissors
- The suction
- Saline flush
- The tissues

2.6 The chain of survival

The chain of survival; is the term given to the procedures applied to individuals who survive sudden cardiac arrest (Dolgun 2021). The adult "Chain of Survival" is recommended for both in-hospital and out-of-hospital cardiac arrest as six chains (Özüçelik 2020). These are (AHA 2020, Dolgun 2021):

In-hospital Cardiac Arrest (IHCA):

1. Chain : Early Recognition and Prevention
2. Chain : Activation of Emergency Response
3. Chain : High Quality CPR
4. Chain : Defibrillation
5. Chain : Post-cardiac Arrest Care
6. Chain : Recovery

Out-of-hospital Cardiac Arrest (OHCA):

1. Chain: Activation of Emergency Response
2. Chain: High Quality CPR
3. Chain: Defibrillation
4. Chain: Advanced Resuscitation
5. Chain: Post-cardiac Arrest Care
6. Chain: Recovery

2.7 Adult basic and advanced life support

The steps of Basic Life Support are listed as follows:

1. The rescuer first ensures the safety of himself, the victim and those around him.
2. Ask the victim if they are alright and gently shake their shoulders. It is checked out loud. If the victim cannot respond, the victim is laid on their back on a hard surface, and the head is tilted back, chin upwards, to ensure the airway opens. Breathing is evaluated using the "look, listen, feel" method, not exceeding 10 seconds.
3. If the casualty is not breathing or breathing abnormally (gasping), the emergency response system is dialed, and the call system is activated.
4. If there is another person next to the rescuer, he is sent to get an automatic external defibrillator (AED) and bring it.
5. If the rescuer is alone, they do not leave the victim alone and immediately begin CPR. Kneeling beside the victim, chest compressions should be strong and rhythmic, applied to the lower half of the sternum (center of the chest) in adults at a rate of 100-120 compressions per minute. During these compressions, the chest should depress at least 5 cm (but not exceed 6 cm), and the hands should not be lifted from the chest (without leaning on the chest) until allowing it to fully rise again.

6. If the rescuer is trained, after 30 chest compressions, the head is tilted back and the chin is lifted to reopen the airway. The rescuer uses the thumb and index finger of the hand on the victim's forehead to close the victim's nose by pinching it. The chin is kept upward to open the mouth. The rescuer takes a normal breath and places their lips around the victim's mouth, ensuring no air leakage. Each breath is delivered into the victim's mouth, raising the chest wall, for about 1 second. While maintaining the head tilt and chin lift position, the rescuer removes their mouth from the victim's, and the chest is allowed to fall as air exits. The second breath should be given as soon as the chest wall descends. The rescuer should not delay chest compressions for more than 10 seconds while providing two breaths, even if the breaths are not effective. CPR should continue with a compression-ventilation ratio of 30:2. If the rescuer is unable to provide ventilation or is untrained, CPR should continue with chest compressions only at a rate of 100-120 per minute.
7. When the AED is accessed, the device is opened, and the electrode pads are attached to the victim's chest. If the rescuer is not alone while placing the pads on the chest, the other rescuer should continue CPR. The AED's audio and visual prompts are followed to assess the rhythm. If a shockable rhythm is detected, the shock button is pressed. No one should touch the victim during the delivery of the shock. If the AED does not indicate a shockable rhythm, CPR should be continued. Additionally, if the AED is not available or is expected to arrive, CPR should be continued during this process..
8. CPR should be continued until emergency medical services arrive, the victim awakens, starts moving, opens their eyes, usually breathes, or until the rescuer becomes exhausted. If the patient/victim is now providing normal breathing, they should be placed in the recovery position and closely monitored (Dolgun 2021, Olasveengen *et al.* 2021).

Advanced life support includes chest compressions performed effectively without interruption, advanced airway interventions during cardiac arrest (the bag valve mask, ventilator, etc. Dec.), end-tidal CO2 (ETCO2), early defibrillation of shockable rhythms with monitoring (VF / pulseless VT), application of shockable rhythms (asystole /

pulseless electrical activity (NEA)) treatment protocols, intravenous route (IV) opening, intraosseous route preference if this is not possible, and drug applications (Özüçelik 2020, Turhan 2022).

2.8 Effectivity rate of CPR

The role of CPR in oxygenation of the body and brain is critical, preparing the body for advanced life support and defibrillation. When defibrillation is not indicated for rhythms considered "non-shockable," such as pulseless electrical activity (PEA), effective CPR remains crucial. CPR alone may lead to relatively few complete recoveries; however, the outlook without CPR is nearly uniformly fatal (Horschitzka and Eberl 2015).

Immediately following a sudden VF cardiac arrest, CPR followed by immediate defibrillation significantly improves survival rates. The survival rate of individuals who are witnessed and "shocked" can reach as high as 57 percent (Serin and Caglar 2020).

In cities like New York, where these advantages are not present, the survival rate is only 5 percent for witnessed shockable arrests. Similarly, in-hospital CPR demonstrates higher success rates when arrests are witnessed or occur in the ICU or among patients wearing heart monitors, enabling immediate detection of arrests (Muliyah *et al.* 2019). These findings underscore the critical role of timely intervention and the circumstances surrounding cardiac arrests in determining patient outcomes.

2.9 Roles of nurses during CPR

Nurses spend more time with patients and their relatives in the clinic; therefore, they are the first person and detector to reach the patient in case of arrest (Güven and Karabulut 2018). In this respect, nurses act as guides and keys to managing CPR processes (Cafer-Karalar and Özer 2023; Efil and Türen, 2015).

- Having up-to-date knowledge and skills on CPR, as well as being adequately equipped regarding the duties, powers, and responsibilities within the regulation,
- Notifying the team that will provide advanced life support for the patient who requires CPR,
- Keeping daily track of the supplies in the emergency medicine cart,
- Early recognition of cardiac arrest and immediate intervention,
- Monitoring and interpreting cardiac rhythm, recognizing lethal rhythms, and knowing the necessary emergency interventions,
- Participating in basic or advanced life support applications (oxygen administration, respiratory support, heart massage, emergency medications, application of medical devices, etc.) in line with the protocols determined by the institution,
- To follow the patient's response to treatment and care and, if necessary, submit a report to the relevant parties,
- Preparation and administration of emergency medications during CPR,
- Mastering and monitoring the effects of applied medications and treatments,
- Monitoring the patient's vital functions,
- Having sufficient expertise in non-drug methods such as pacemaker (patient preparation, follow-up before, during, and after the procedure) and defibrillation (indication, application stages),
- Assisting with conscious sedation when necessary,
- Ability to take blood and evaluate laboratory results,
- Providing psychosocial support to the family who witnessed the arrest,
- Recording the initiatives taken.

3. MATERIALS AND METHOD

3.1 Study design

From November 17th, 2023, to December 10th, 2023, we conducted a descriptive cross-sectional study in Nasiriyah City, Iraq, to assess nursing knowledge about CPR.

3.2 Population and sample of the research

The study was conducted at Shastra General Hospital in Nasiriyah, Iraq. The total number of nurses working in the emergency department and intensive care units in this hospital is 285 (Table 3.1). The following formula was employed for calculating the sample: n=N x t2 x p x q / d2 (N-1) + t2 x p x q (Karasar 2014). The calculation was based on a theoretical t-value of 1.96, a confidence interval of 95%, and a sampling error of 0.05. When the research data were formulated based on these values and using the formula mentioned above, the sample size representing a population of 285 individuals was found to be at least 164 subjects. The number of nurses who participated in this study was 190.

Table 3.1 The information about nurses working in the units

Units		**Number of Nurses**
Resuscitation units	Intensive care unit (ICU)	100
	Coronary care unit (CCU)	38
	Recovery care unit (RCU)	21
Emergency department		126

In the research, “Using the " G- Power-3.1.9.2" program, the power of the study was calculated after collecting the sample size at a 95% confidence level. According to the power analysis conducted according to whether the knowledge levels of the participants differ according to their educational status, with an alpha of 0.05 and an effect size of 0.27, the power of the study was calculated at 89.6% (Figure 3.1).

F tests - ANOVA: Fixed effects, omnibus, one-way

Analysis: Post hoc: Compute achieved power

Input: Effect size f=0.2743516

α err prob=0.05

Total sample size=190

Number of groups=4

Output: Noncentrality parameter λ=14.3010721

Critical F=2.6531647

Numerator df=3

Denominator df=186

Power (1-β err prob)=0.8961908

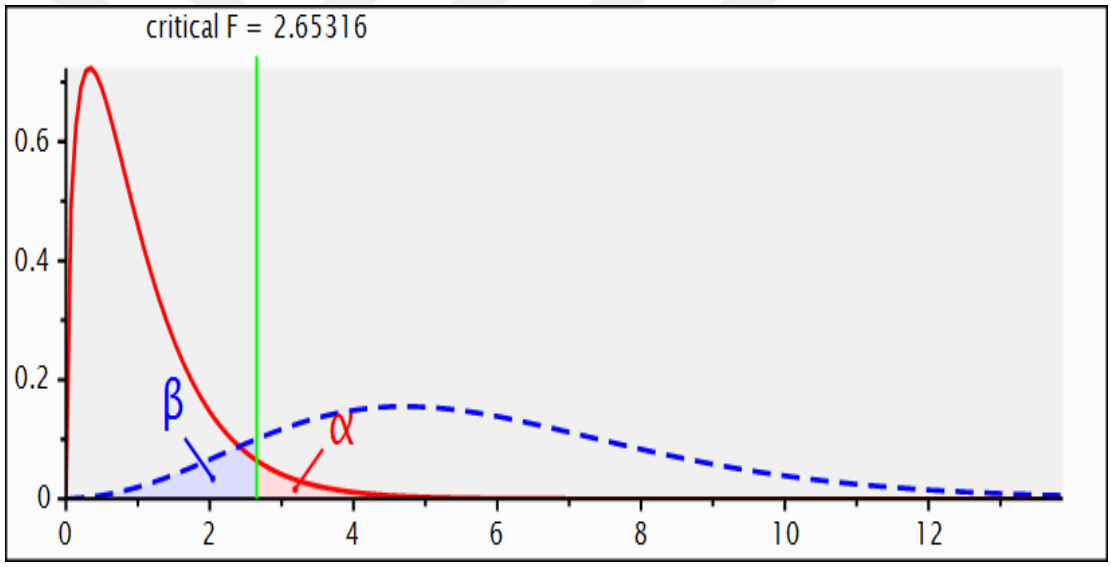

Figure 3.1 G- power analysis

3.2.1 Research admission criteria

There are inclusion criteria for selecting the sample that include:

- Participants must be currently employed or working in an intensive care unit or emergency department.

- The minimum level of experience in years working in intensive care or emergency settings was 1 year.
- Obtaining initial consent from nurses to participate in the study.

3.2.2 Research exclusion criteria

All the nurses who did not work in the intensive care unit and emergency unit, such as the coronary care unit, as well as nurses who refused to participate in the study.

3.3 Data collection tools

The study instrument was a questionnaire related to sociodemographic data and measures nurses' knowledge about CPR.

3.3.1 Socio-demographic form for nurses

The researchers created this form to collect information on the sociodemographics of the nurses. The sociodemographic data form consists of a total of nine questions: age, gender, region of residence, marital status, education level, years of service in nursing, current workplace, if they have any CPR training courses, and whether you provide CPR to the patient (see Appendix 1).

3.3.2 Nurses' knowledge about CPR

After reviewing numerous studies in the literature (Al-Janabi and Al-Ani, 2014; Mohammed *et al.* 2020; Olasveengen *et al.* 2021), researchers created the questions. In this context, a total of 19 multiple-choice questions containing current information on CPR were prepared (Appendix 1). Correct answers to the questions were evaluated as 1 point, and incorrect answers as 0 point.

The maximum achievable score for this questionnaire was 19, the lowest value was 3, and the mean score was 10. The Cronbach test calculated in this study was good, where the Cronbach test was 0.821.

The nurses were visited in their units in the hospitals where the research was conducted. Volunteer nurses filled out the data collection tools in approximately 5 minutes. Before starting the interview, written and oral approval was obtained from each participant.

3.4 Ethical approval

For the research, permission was obtained from the Ethics Committee of Çankırı Karatekin University (Date: 10/10/2022, Meeting No. 26), as shown in Appendix 2. Also, permission approval was obtained from the Shatra General Hospital of the Iraqi Ministry of Health/Environment institution (Date: 24/04/2022, No. 288), as shown in Appendix 3. Participants who met the inclusion criteria received comprehensive information about the study's objectives and the questionnaire that would be utilized. They were briefed on the potential benefits and risks associated with the study. Throughout the research process, participants were explicitly informed that they had the freedom to withdraw at any point. The study commenced only after obtaining their oral informed consent, emphasizing the importance of voluntary participation and the participants' autonomy in the research.

3.5 Analysis of data

The data obtained in the study were analyzed using the SPSS (Statistical Package for Social Sciences) for Windows 25.0 program. Descriptive statistical methods (frequency, percentage, min-max values, mean, and standard deviation) were utilized during the evaluation of the data. Cronbach's alpha values were calculated to test the reliability of the scales used in the study. The normal distribution suitability of continuous variables used in the research was checked. Normal distribution suitability was examined in three different ways. Suitability to a normal distribution was determined by analyzing the

Shapiro-Wilk or Kolmogorov-Smirnov tests. Additionally, it was examined with a Q-Q plot drawing. In this method, it is investigated whether the data used in the study show a normal distribution by checking if the skewness and kurtosis values are within ±3.

Parametric tests were used for statistical evaluations of variables with a normal distribution. An independent t-test was employed for comparing quantitative data between two groups with a normal distribution. The F-test was utilized for more than two groups.

When examining the kurtosis and skewness values of the participants, it was observed that knowledge scores exhibited a normal distribution within the range of ±3 (see Table 3.2).

Table 3.2 Kurtosis and skewness values for knowledge questions

	Kurtosis	Std. Error of Kurtosis	Skewness	Std. Error of Skewness
Total knowledge points	-0.716	0.351	0.467	0.176

4. RESULTS

4.1 The demographic characteristics of participants

The distribution of information on the demographic characteristics of the participants is given in Table 4.1. It was determined that 25.8% of the participants were under the age of 25, 28.9% were between the ages of 26 and 30, 16.8% were between the ages of 31 and 35, and 11.1% were 41 years and over. It was determined that 41.6% of the participants were male, 58.4% were female, 46.8% lived in rural areas, and 53.2% lived in urban areas. It was determined that 32.1% of the participants were single, and 67.9% were married. When the distributions related to educational status were examined, it was found that 42.1% were nursing bachelor's degree graduates and 17.9% were master's degree graduates.

When the distribution of years of nursing service was examined, 37.9% had 1–5 years of service, 29.5% had 6–10 years of service, 10% had 11–15 years of service, and 22.6% had 16 years or more of service. When the current working areas of the participants were examined, 44.7% of them worked in the intensive care unit, 55.3% worked in the emergency unit, and 55.8% did not receive any training on CPR. 35.8% of the nurses stated that they performed daily CPR on the patient, 27.9% performed weekly CPR on the patient, 23.7% performed monthly CPR on the patient, and 12.6% performed annual CPR on the patient.

Table 4.1 The demographic characteristics of the participants

			Number	**Percentage**
Age	<= 25		49	25.8
	26-30		55	28.9
	31-35		32	16.8
	36-40		21	11.1
	41+		33	17.4
Gender	Male		79	41.6
	Woman		111	58.4
Residence area	Rural		89	46.8
	Urban		101	53.2
Marital status	Single		61	32.1
	Married		129	67.9
Education	Secondary nursing school		24	12.6
	Diploma nursing graduate		52	27.4
	Bachelor's degree in nursing		80	42.1
	Post graduate		34	17.9
Years of service in nursing	1-5		72	37.9
	6-10		56	29.5
	11-15		19	10.0
	16+		43	22.6
Current workspace	Intensive care unit		85	44.7
	Emergency unit		105	55.3
Do you have any CPR-related training courses?	Yes		84	44.2
	No		106	55.8
Do you perform CPR on the patient?	Daily		68	35.8
	Weekly		53	27.9
	Monthly		45	23.7
	Yearly		24	12.6
	Minimum	**Maximum**	**Average**	**Standard deviation**
Age	17.00	56.00	32,32	8.58
Years of service in nursing	1.00	36.00	10,22	8.36

4.2 Association between demographic characteristics and nurses' knowledge about CPR

When the distribution of knowledge scores according to the demographic characteristics of the participants is examined, as shown in Table 4.2:

It was determined that knowledge scores did not show a statistically significant difference according to the age of the participants ($F = 1.472$; $p = 0.212$).

It was determined that knowledge scores did not show a statistically significant difference according to the gender of the participants ($t = 1.766$; $p = 0.079$).

It was determined that knowledge scores did not show a statistically significant difference according to the area where the participants lived ($t = 0.709$; $p = 0.479$).

It was determined that knowledge scores did not show a statistically significant difference according to the marital status of the participants ($t = -0.700$; $p = 0.485$).

It was determined that knowledge scores showed a statistically significant difference according to the participants' educational status ($F = 4.797$; $p = 0.003$). According to the multiple comparison test performed to determine the groups showing differences, the knowledge scores of nursing school graduates were lower than those of bachelor's and master's degree graduates.

It was determined that knowledge scores did not show a statistically significant difference according to the participants' years of service ($F = 1.291$; $p = 0.279$).

It was determined that the knowledge scores showed a statistically significant difference according to the current working area of the participants ($t = 4.061$; $p = 0.000$).

It was determined that individuals working in the intensive care unit had higher knowledge scores than those working in the emergency unit. It was determined that knowledge scores did not show a statistically significant difference according to the participants' receiving training courses on CPR (t = 0.307; p = 0.759). It was determined that the knowledge scores showed a statistically significant difference according to the participants' CRP status (F = 16.596; p = 0.000). According to the multiple comparison test performed to determine the groups showing differences, it was determined that nurses who performed daily and weekly CPR on the patient had a higher level of knowledge than those who performed monthly and annual CPR on the patient.

Table 4.2 The comparison of knowledge scores based on participants' demographic characteristics

		Total knowledge points		Test value	p value	Bonferroni
		Average	Standard deviation			
Age	<= 25	9.20	4.05	1,472 F	0.212	---
	26-30	9.47	3.95			
	31-35	11,16	4.82			
	36-40	10.95	4.96			
	41+	10.42	4.80			
Gender	Male	10.68	4.56	1,766 t	0.079	---
	Female	9.54	4.28			
Residence area	Rural	10.26	4.81	0.709 t	0.479	---
	Urban	9.80	4.06			
Marital status	Only	9.69	4.17	-0,700t -	0.485	---
	Married	10,17	4.55			
Education	Nursing School (1)	7.79	3.16	**4,797 F**	**0.003***	**1<3.4**
	Diploma Nursing Graduate (2)	9.13	4.19			
	Nursing Bachelor's Degree (3)	10.61	4.30			
	Master's Degree (4)	11.53	5.06			
Years of service nursing	1-5	9.99	4.32	1,291 F	0.279	--
	6-10	9.79	4.52			
	11-15	11.84	4.69			
	16+	9.56	4.31			
Current workspace	Intensive care unit	11.45	4.88	**4,061 t**	**0.000***	--
	Emergency unit	8.86	3.64			
CPR-related training courses	Yes	9.90	4.58	-0.307t -	0.759	---
	No	10,10	4.31			
Do not perform CPR on the patient	Daily (1)	11.97	3.92	**16,596 F**	**0.000***	**1.2>3.4**
	Weekly (2)	10.91	4.78			
	Monthly (3)	7.67	3.42			
	Annual (4)	6.92	2.83			

F: One-way analysis of variance, t: independent sample t test

4.3 Distribution of answers to knowledge questions

When the distribution of answers to knowledge questions of the participants is examined, as shown in Table 4.3:

Regarding answers to knowledge questions, 65.8% of the nurses answered the question of the current CPR application order, 58.9% answered the question of what rate of artificial respiration should be applied, 56.3% answered the question of what should be done first when they find a person lying motionless on the road, and 62.6% answered the question of what should be done first when they find a person lying motionless on the road. To the question of EMS application steps, 73.2% answered incorrectly to the question about the type of artificial respiration to be given during CPR, 65.8% to the question about the frequency of emergency car checks, 62.1% to the question about first aid in drowning, and 50.5% to the question about the use of defibrillation.

Additionally, 76.3% of nurses provided correct answers to the definition of CPR, 62.1% knew the first intervention required in cardiac arrest, 57.7% knew which artery to use for a pulse check, 53.2% knew the correct compression site, 69.5% knew the appropriate compression depth, 55.8% knew the correct compression rate per minute for adults, 68.9% knew the compression-ventilation ratio for a single rescuer in adults, 59.5% knew how many times breaths should be given per minute by the rescuer, 65.3% knew the abbreviation for EMS, 79.5% knew the first drug used in cardiac arrest, and 52.1% knew the appropriate action to take when rescue breaths cannot be given during CPR.

Table 4.3 Distribution of answers to knowledge questions

Questions	**Wrong answers**		**Correct answers**	
	n	%	n	%
K1	45	23.7	**145**	76.3
K2	**125**	65.8	65	34.2
K3	**112**	58.9	78	41.1
K4	**107**	56.3	83	43.7
K5	72	37.9	**118**	62.1
K6	**119**	62.6	71	37.4
K7	86	45.3	**104**	54.7
K8	89	46.8	**101**	53.2
K9	58	30.5	**132**	69.5
K10	84	44.2	**106**	55.8
K11	59	31.1	**131**	68.9
K12	77	40.5	**113**	59.5
K13	**139**	73.2	51	26.8
K14	**125**	65.8	65	34.2
K15	66	34.7	**124**	65.3
K16	**118**	62.1	72	37.9
K17	39	20.5	**151**	79.5
K18	**96**	50.5	94	49.5
K19	91	47.9	**99**	52.1

5. DISCUSSION

The results of this study showed that the largest sample size was between 26 and 30 years old. In the study of Ahmed and Al-Sawaf (2016), the majority of nurses were between the ages of 28 and 37. This result is similar to the result of our study. In addition, this result is in line with another study showing that the majority of the participants were in the 26–48 age groups (Munezero *et al.* 2018). In this study, it was shown that the majority of the study sample was females. These results are consistent with the results of some studies. In these studies, it was stated that the majority of the sample was female (Elbaih *et al.* 2019, Munezero *et al.* 2018, Saud *et al.* 2020). It was determined that most of the participants in the study were married at a rate of 67.9%. This result is compatible with the study of Al-Hadrawy *et al.* (2021), in which the rate of married people was 71.7 percent.

The present study has also found that 42.1 percent of the nurses had a bachelor's degree in nursing. This result agrees with previous studies that were conducted in other countries; Al-Janabi and Al-ani (2014) found that 41.2 percent of the nurses had a bachelor's degree. According to Wendel (2011), the great majority of nurses (65%) had bachelor's degrees. This result can be interpreted as a bachelor's degree in an intermediate stage between the primary school stage and postgraduate school, and this comes in accordance with the results of the current study, which found most nurses are between the ages of 26 and 30.

The current study also found that most nurses of work experience from 1 to 5 years was 37.9%, 55.3% of the samples worked in emergency units, and most nurses had no training courses about CPR (54%). This outcome may be consistent with Al-Janabi and Al-Ani (2014), who discovered that 56.5% of the nurses have less than five years of experience, 30.6% of the samples worked in emergency units, and 61.2% of the nurses had no CPR training.

5.1 Discussion of the relationship between demographic characteristics and nurses' knowledge about CPR

It was determined that knowledge scores did not show a statistically significant difference according to the age, gender, area where the participants lived, marital status, years of service, and having CPR-related training courses ($p > 0.05$). These findings are in line with the results of Al-Janabi and Al-Ani (2014), suggesting a non-significant association between nurses' knowledge in domains such as cardiac arrest and cardiopulmonary resuscitation and their gender, age group, years of work experience, area of assignment, formal training, and frequency of CPR performance. In line with Al-Kandary *et al.* (2007) and Rajeswaran (2009), our study concurs with their findings, suggesting a non-significant association between nurses' knowledge of CPR and their gender.

The study conducted by Kalhori *et al.* (2017) found a non-significant association between nurses' knowledge about CPR procedures and various factors, including their gender, age group, years of work experience, and formal training. This suggests that, according to the study's findings, these demographic and professional factors did not significantly influence nurses' knowledge of CPR procedures.

A study by El-Meanawi (2015) in Egypt, which contrasted with our findings, showed a high mean score (232.9 32.5) for overall knowledge in the age group (>26 years). Additionally, there was a high mean score (225.7 ± 41.1) for total knowledge in individuals with more than 4 years of experience in both units. This suggests that increased age and years of experience may enhance knowledge, although the observed differences were not statistically significant.

In this study, it was shown that there is a significant effect between the educational level and the knowledge of nurses about CPR. According to the multiple comparison test conducted to identify different groups, the knowledge scores of nursing school graduates are lower than those with bachelor's degrees and master's degrees. This finding is consistent with reports that nurses with a bachelor's degree or higher CPR

knowledge surpass them (Al-Janabi and Al-Ani 2014). Degree results obtained are higher than those with a diploma equivalent. It is clear from the statistical results that there is a statistically significant relationship between education and the level of knowledge. This result is also consistent with some research results (El-Meanawi 2015, Kartal 2021, Marzood and Lyneham 2009). It is an expected result that higher education has a significant impact on nurses' knowledge.

In this study, it was concluded that there is a significant effect between the nurse's knowledge of their area of assignment and their knowledge of unconsciousness. It was determined that individuals working in the intensive care unit had higher knowledge scores than those working in the emergency unit. When the relevant literature is examined, it is seen that in the majority of the studies, the working area contributes to the increase in CPR knowledge score (Ahmed *et al.* 2017, Marzooq and Lyneham 2009, Parajulee and Selvaraj 2011). However, Al-Janabi and Al-Ani (2014) found that the level of CPR knowledge of nurses was unaffected by their workplaces. Kartal (2021) found that the mean total CPR scores of nurses working in the emergency medicine clinic were higher than in the intensive care clinic. The fact that this situation may vary depending on the level of CPR used in the areas where nurses work helps to explain it.

With regard to the frequency of CPR performance on the patients and its relationship to the knowledge of nurses, the present study showed that there is a significant association between the nurses' knowledge of cardio-pulmonary resuscitation procedures and their frequency of CPR performance on the patients. According to the multiple comparison test performed to identify different groups, it was determined that nurses who performed daily and weekly CPR on the patient had a higher level of knowledge than those who performed monthly and annual CPR on the patient. This finding conflicts with research by Al-Janabi and Al-Ani (2014) and Plagisou *et al.* (2015), which found that the severity of the nurses' knowledge of cardiopulmonary resuscitation and the frequency with which they performed CPR on patients were unrelated. Because the only nurses who are able to administer CPR correctly, even in the most extreme circumstances, are those who have learned everything that they need to know regarding the technique of administering CPR (Rajeswaran 2009).

5.2 Discussion of answers to knowledge questions

Regarding answers to knowledge questions, 65.8% of the nurses answered the question of the current CPR application order, 58.9% answered the question of what rate of artificial respiration should be applied, 56.3% answered the question of what should be done first when they find a person lying motionless on the road, and 62.6% answered the question of what should be done first when they find a person lying motionless on the road. To the question of EMS application steps, 73.2% answered incorrectly to the question about the type of artificial respiration to be given during CPR, 65.8% to the question about the frequency of emergency car checks, 62.1% to the question about first aid in drowning, and 50.5% to the question about the use of defibrillation. In Kartal's (2021) study, 41.7% of nurses correctly knew the updated CPR sequence. Chandrasekaran *et al.* (2010) conducted a study with medicine, dentistry, nursing, and medical faculty students, where 89% of them answered the question of EMS application steps, 59% answered the question of the first thing to do when they find a person lying motionless on the road, and 87% answered the question of first aid application in drowning. They found out that they answered incorrectly. In Owaid's (2022) study, it was determined that 68% of the nurses gave the wrong answer to the question of what breathing interval should be given in CPR and 35.3% to the defibrillation question. Although the research results were generally parallel to ours, they show that nurses have deficiencies in following current guidelines and updating their knowledge.

In our study, 76.3% of nurses provided correct answers to the definition of CPR, 62.1% knew the first intervention required in cardiac arrest, 57.7% knew which artery to use for a pulse check, 53.2% knew the correct compression site, 69.5% knew the appropriate compression depth, 55.8% knew the correct compression rate per minute for adults, 68.9% knew the compression-ventilation ratio for a single rescuer in adults, 59.5% knew how many times breaths should be given per minute by the rescuer, 65.3% knew the abbreviation for EMS, 79.5% knew the first drug used in cardiac arrest, and 52.1% knew the appropriate action to take when rescue breaths cannot be given during CPR. The study done by Owaid (2022) revealed that 86.7% of nurses were asked about the definition of CPR, 22.3% were asked about the first intervention to be performed in

cardiac arrest, 80% were asked about which artery should be used for pulse control, 52.3% were asked about the location of the chest pressure, 60.3% were asked about the depth of chest pressure, 37% were asked about the number of chest pressures that should be applied per minute in an adult, 41.3% were asked about the only saving adult chest compression – 52.3% answered correctly to the ventilation rate question, 57.5% answered correctly to the first medication question used in cardiac arrhythmia and 59% answered correctly to the Hand only application question, and 52.3% answered correctly to the question of how many times a minute rescue breath should be given. In the Kartal (2021) study, 52.5% of the nurses correctly answered the question about chest compression depth. In the studies of Aygin *et al.* (2018), 76.3% of nurses correctly answered the question of the number of chest compressions that should be applied per minute in adults, 91.8% answered the question of chest compression-ventilation ratio, and 89.7% answered the question of chest compression depth correctly. In the studies of Chandrasekaran *et al.* (2010), 56% of the participants answered the abbreviation question of EMS correctly. In addition to findings similar to our study in the literature, different results have been found. The reason for the differences is thought to be due to the fact that the research was conducted in different clinics and hospitals.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In view of the findings that were gathered, the study came to the following conclusions:

- The largest number of the study sample were between 26 and 30 years old.
- The majority of participants were women.
- Regarding education level, the highest number of participants in this study have an associate bachelor's degree in nursing.
- As for the years of experience, the largest number of nurses had experienced 1–5 years.
- In this study, most participating nurses did not have CPR training.
- The largest number of nurses in this study performed daily CPR.
- The majority of nursing participants in this study were from the emergency unit.
- This study found a non-significant association between nurses' knowledge about CPR and various factors, including their age group, gender, living area, participants' years of service, marital status, and CPR-related training courses.
- It was determined that the level of CPR knowledge increased as the level of education increased, and the level of CPR knowledge of nurses who worked in the emergency department and practiced CPR on a daily basis was higher.

5.2 Recommendations

Based on the previously listed results of the study, the researcher recommends the following:

1. The frequency of in-service training in the institutions where we work should be increased.
2. Individual factors such as nurses' education level, field of work, and practical experience should be taken into account when designing training programs.
3. The motivation of nurses to participate in training and courses should be increased.
4. It should be mandatory to obtain an advanced life support certificate.
5. New regulations for CPR should be announced in light of current guidelines through seminars, in-service training, and conferences in health institutions,
6. It is recommended to conduct studies evaluating the effectiveness of training modules based on different training models in CPR training for nurses.

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APPENDICES

APPENDIX 1. Questionnaire

APPENDIX 2. Ethics committee permission

APPENDIX 3. Ethics committee approval from Iraq

APPENDIX 1. Questionnaire

We welcome you to WASAN GHAZI KADHIM KADHIM and DR.ÖĞR.ÜYESİ AYŞE ÖZGE DENİZ "Assessment of nurses knowledge about cardiopulmonary resuscitation in intensive care units and emergency department in Iraq" We invite you to research titled. Before deciding whether to participate in this research or not, you need to know why and how the research will be conducted. For this reason, it is very important to read and understand this form. If there are things you do not understand and are not clear to you, or if you would like more information, ask us. Participation in this study is entirely voluntary. You have the right not to participate in the study or to quit at any time after joining. Your response to the study will be interpreted as giving your consent to participate in the study. Do not be under the pressure or suggestion of anyone while answering the questions on the forms given to you. Personal information obtained from these forms will be kept completely confidential and used only for research purposes.

Part 1: Demographic characteristics

1.Age:…….

2.Gender:

a.Male

b.Female

3.Residents:

a.Rural

b.Urban

4.Marital status:

a.Single

b.Married

5.Education

a.Secondary nursing school

b.Diploma nursing graduate

c.Bachelor nursing graduate

d.Post graduate

6.Years of service in nursing:……..

7.Current workplace:

a.Intensive care unit

b.Emergency unit

8. Do you have any training courses on CPR?

a.Yes

If yes

Duration of the course

Name of the training place

b.Both

9.Do you perform CPR on the patient?

a. Daily
b. Weekly
c. monthly
d. annually

Part 2: Nurses' knowledge about CPR

1. What does CPR mean to you?

a) Call, Plan, Respond
b) Coronary Pathogen Revival
c) Cardio-Pulmonary Resuscitation
d) Capillary Process Review

2. Which of the following is the updated sequence of adult cardiopulmonary resuscitation intervention for healthcare professionals?

a) Circulation- Airway- Breathing
b) Airway - Circulation - Breathing
c) Circulation - Breathing -Airway
d) Airway - Breathing - Circulation

3. The nurse should give artificial respiration at a rate

a) Once every 2-3 seconds
b) Once every 4-5 seconds
c) Once every 5-6 seconds
d) Once every 8-9 seconds

4. When you find someone unresponsive in the middle of the road, what should your first response be? (Note: You are alone)

a) Open airway
b) Start chest compression
c) Look for safety
d) Give two breathings

5. The first and necessary step in treating a cardiac arrest is immediate recognition. The paramedic should

a) Check pulse and breathing.
b) Check your blood pressure.
c) Tapping the victim's shoulder, asking him, "Are you okay?"
d) Check the temperature

6. If you confirm somebody is not responding to you even after shaking and shouting at him, what should your immediate action be?

a) Start CPR
b) Activate EMS
c) Put him in recovery position

d) Observe

7. When assessing the pulse of an unconscious victim, which of the following is the best artery to check for a pulse?

a) Radiological
b) Femoral
c) Carotid
d) Humeral

8. What is the location for chest compressions?

a) Left side of the chest
b) Right side of the chest
c) Mid chest
d) Xiphisternum

9. What is the correct depth of chest compression for adults?

a) 2 inches (5cm)
b) 3 inch (7.5cm)
c) 1 inch (2.5cm)
d) 0.5 inch (1.25cm)

10. What is the correct rate of chest compression for adults?

a) 60-80/min
b) 80-100/min
c) 100-120/min
d) 120-150/min

11. What is the correct ratio of CPR for an adult when there is a single rescuer?

a) 15:2
b) 5:1
c) 30:2
d) 15:1

12. The nurse should give artificial respiration at a rate

a) 10 times per minute
b) 12 times per minute
c) 14 times per minute
d) 16 times per minute

13. What type of artificial respiration should be given during cardiopulmonary resuscitation?

a) Superficial breath
b) Normal breath
c) Deep breath
d) An intense breath

14. How often should the emergency vehicle be checked in the lobby? Or Where in a hospital?

a) At the beginning of every week
b) At every shift
c) Once every month
d) Every day

15. What does the abbreviation EMS stand for?

a) Effective Medical Services
b) Emergency Management Services
c) Emergency Medical Services
d) External Medical Support

16. You witness an adult unresponsive victim who has just been removed from submersion in fresh water. He has spontaneous breathing, but is unresponsive. What should your first response be?

a) CPR for 2minutes and inform EMS
b) CPR for 1minute and inform EMS
c) Compress the abdomen to remove the water
d) Keep him in recovery position

17. What is the first medication given in cases of cardiac arrest?

a) Vasopressin
b) Atropine
c) Adrenaline
d) Magnesium sulfate

18. Defibrillation?

a) It is the process of connecting an electrical device and delivering electrical solid shocks to the heart.
b) It must be implemented immediately after the patient is diagnosed with an emergency heart problem.
c) Applied to correct heart fibrillation that leads to cardiac arrest
d) All mentioned above

19. If you do not want to give mouth-to-mouth CPR, which of the following is NOT an appropriate course of action?

a) Mouth-mask ventilation and chest compression
b) Chest compression only
c) Bag mask ventilation with chest compression
d) No CPR

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CURRICULUM VITAE

Personal Information

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