Effect of Educational Program Regarding Care of Patients with Intra-Aortic Balloon Pump on Critical Care Nurses' Knowledge and Practice

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Abstract

Background: The intra-aortic balloon pump is a mechanical circulatory assist device used in some cardiac disorders to enhance coronary perfusion and reduce afterload through synchronized balloon inflation and deflation within the aorta. **Aim**: To evaluate effect of educational program regarding care of patients with intra-aortic balloon pump on critical care nurses' knowledge and practice. **Design**: A quasi-experimental research design with one group was used. **Setting**: The study conducted in the Cardio-Thoracic care unit and the Coronary Care Unit at Suez Canal University Hospitals in Ismailia city, Egypt in addition to the Cardio-Thoracic care unit and the Coronary Care Unit at specialized hospital in El Giza, Cairo. **Subjects:** A purposive sample of sixty critical care nurses who involved in direct patient care is considered the main subject in this study. **Tools:** Two tools used to collect data: Tool (I) Nurses' self-administered knowledge questionnaire to assess nurses' knowledge regarding IABP, Tool (II) Nurses' practice observational checklists to assess nurses' level of practice regarding intra-aortic balloon pump care and management. **Results:** It showed that the studied nurses' knowledge regarding intra-aortic balloon pump was unsatisfactory in 69% of nurses' in the assessment phase to be satisfactory during immediate and after three months post educational program implementation as 86.6% and 73.3% of nurses respectively. Also, 65% of the studied nurses had unsatisfactory total level of practice during the assessment phase to be satisfactory during immediate and after three months post educational program implementation as 86.7% & 76.7% of nurses, respectively. **Conclusion**: there was a statistically significant improvement in nurses' total knowledge and practice levels regarding care of patients with an intra-aortic balloon pump immediately and after three months post-implementation of the educational program with statistically significant difference. **Recommendations:** implement standardized care protocol and critical care guidelines for intra-aortic balloon pump management across the critical care units.

Keywords: Critical Care Nurses, Educational Program, Intra-Aortic Balloon Pump, knowledge, practice

1. Introduction

Cardiovascular diseases (CVDs) represent a spectrum of disorders, including coronary artery diseases, peripheral arteries

diseases, and rheumatic heart disease, CVDs remains a leading cause of morbidity and mortality worldwide. Key risk factors include modifiable lifestyle behaviors such as unhealthy dietary patterns, physical inactivity, tobacco use, and excessive alcohol consumption, as well as environmental exposures like air pollution. These factors contribute to pathophysiological conditions such as hypertension, dyslipidemia, hyperglycemia, and obesity, which collectively heighten the risk of adverse cardiovascular events. Addressing these determinants is critical to reduce the global burden of CVDs **(WHO, 2021).**

Treatment for CVDs involves a combination of lifestyle changes, medical therapies, and advanced interventions. Pharmacological treatments target blood pressure, cholesterol, and blood sugar management using medications like antihypertensive, statins, and antidiabetics. In severe cases, mechanical support devices such as the Intra-Aortic Balloon Pump (IABP) may use to improve heart function by enhancing coronary blood flow and reducing cardiac workload. For advanced conditions, procedures like angioplasty, stent placement, or bypass surgery may be necessary. Comprehensive care often incorporates cardiac rehabilitation and patient education to address risk factors and prevent recurrence **(Ghodeshwar, 2023).**

The IABP is a mechanical hemodynamic support device that uses counter pulsation to provide temporary circulatory assistance. An IABP is used to manage cardiogenic shock, refractory unstable angina, acute myocardial infarction, and refractory or intractable ventricular tachycardia. The device may also use to support patients before and after cardiac surgery and to serve as a bridge to advanced therapies such as a left ventricular assist device or transplant **(Garg, 2023).**

Nurses play a pivotal role in ensuring the safe and effective management of patients undergoing IABP therapy. Continuous monitoring of the device is critical to detect malfunctions, including issues with balloon inflation or deflation, while meticulous care of the catheter insertion site prevents infection, bleeding, and displacement **(Ghafoor et al., 2022).** Proper patient positioning and education on therapy reduce anxiety, enhance compliance, and minimize complications **(Khan& Siddiqui, 2022)**.

Monitoring coagulation markers during anticoagulation therapy is essential to balance thrombosis and bleeding risks. During IABP weaning and removal, nurses ensure close observation to prevent bleeding and vascular injury, highlighting nurses' integral role in delivering high-quality patient-centered care **(Ingvarsdottir & Halldorsdottir, 2018).**

Educational programs designed for nurses aim to enhance their knowledge and skills in the safe operation, troubleshooting, and patient care aspects of IABP. These programs typically cover topics like hemodynamic principles, indications and contraindications for IABP use, device setup, waveform interpretation, and complication management. Through structured learning, nurses gain confidence in identifying potential issues, such as balloon rupture or improper timing, responding promptly to ensure patient safety and optimal outcomes **(Amin et al., 2024).** Effective educational programs for nurses on IABP therapy have been shown to significantly improve patient care quality and outcomes, these programs are vital in bridging the gap between theoretical knowledge and clinical expertise in critical care settings **(Mohammed et al., 2024).**

1.2. Significance of the study:

The American College of Cardiology`s benchmark for the incidence of vascular access complications alone has ranged from 0.1% to 61%, depending on the definition of complications, the type of procedure, anticoagulation, closure devices, age, sex and other patient comorbidities. Patient outcomes can improve if there is a greater quality of nursing care **(National Heart, Lung, and Blood Institute (NHLBI), 2024).** Today, more than 160000 patients worldwide receive IABP therapy annually. The primary purpose of therapy is supporting the failing heart by simultaneously increasing myocardial oxygen supply and decreasing myocardial oxygen demand **(Cohen& Patel, 2023).**

This study finding will highlight the effectiveness of educational programs in improving nursing skills, for reducing patient risks, and enhancing the overall quality of care in critical care units **(El-Sayed & Ahmed, 2020).**

The aim of the study: This study aimed to assess the effect of educational program regarding care of patients with intra-

aortic balloon pump on critical care nurses' knowledge and practice

Objectives of the study:

1-Assess critical care nurses' knowledge regarding care of patient with Intra-Aortic Balloon Pump.

2-Assess critical care nurses' practice regarding care of patient with Intra-Aortic Balloon Pump.

3- Design and implement an educational program for critical care nurses about care of patient with Intra-Aortic Balloon Pump.

4-Evaluate effect of educational Program on Critical Care Nurses Knowledge and Practice regarding care of patient with Intra-Aortic Balloon Pump.

Hypothesis

H1: There will be a statistically significant improvement in nurses' level of knowledge regarding care of patient with intra-aortic balloon pump after implementation of the educational program.

H2: There will be a statistically significant improvement in nurses' level of practice regarding care of patient with intra-aortic balloon pump after implementation of the educational program.

2. Subjects and Methods

Study design:

A quasi- experimental research design was used in this study.

Study setting:

This study was conducted at two setting, the Cardio-Thoracic care unit and the Coronary Care Unit at Suez Canal University Hospitals, Ismailia city. In addition to the Cardio -Thoracic care unit and the Coronary Care Unit at specialized hospital in El Giza city, governorate, Egypt.

The sample of the study:

A purposive sample of sixty critical care nurses was involved in providing direct patient care in critical care units.

The study will include registered and licensed nurses who meet the following criteria: having a minimum of six months of experience in critical care units, being employed full-time during the data collection period, and actively involved in direct patient care. Additionally, participants must express their willingness to take part in the study by providing informed written consent. These criteria ensure the selection of experienced

professionals directly engaged in critical care, enhancing the reliability and relevance of the findings. Finally, nurses aged over 50 years will be excluded to maintain a uniform sample relevant to the study objectives.

Tools of data collection:

Two tools were utilized to collect data pertinent to the current study.

Tool I -Nurses' self-administered knowledge questionnaire: consist of two parts:

Part one: Concerned with demographic characteristics and nurses' profile under study as: age, gender, marital status, educational level , position , general years of experience, years of experience in CCU, and previous attendance of training courses regarding IABP (8 items).

Part two: Knowledge regarding IABP. This part developed by the researcher after reviewing literatures and referenced from **(AlyMahgoub & Hafez, 2017).** It was consisted of (30) items, that were retranslated into simple Arabic language to ensure clarity: assess and evaluate nurses' knowledge about description and physiological effects of Intra –Aortic Balloon Pump (items 1-11); indications, contraindications, and complications of Intra-Aortic Balloon Pump (items 12-17); nursing care of patients connected with Intra-Aortic Balloon Pump (items 18-25); in addition to, weaning and removal of Intra-Aortic Balloon Pump (items 26-30). This part needs about 30-40 minutes to be completed.

Scoring

The scoring system distributed according to (**AlyMahgoub & Hafez, 2017)** to be 1 degree for the correct answer and zero for the incorrect answer with total of 30 degrees. Scores were classified into unsatisfactory knowledge level if the total score percentage was less than 85%, and satisfactory knowledge level if the score equal and more 85%. Score of 26 or more out of 30 will classified as satisfactory and score of 25 or less will fall under unsatisfactory.

Tool II: The Nurses' Practice Observational Checklist: It developed by the researcher after reviewing the related literature referenced from **(McGlone &Sadler, 2016).** It was complete by the researcher through observing nurses actions in managing patients with IABP. This tool applied on the patients admitted to CCU with an IABP in place. It was consisted of initial

assessment for patient with IABP **(items from 1-9)**, safe nursing care about IABP **(items from 10-14)**, regular patient monitoring **(items from 15-19)**, complications of IABP awareness **(items from 20-24),** preparation of removal of IABP **(items from 25-30),** and nursing considerations during weaning and IABP removal **(items from 31-42)**. This part needs about 40 minutes to be completed.

Scoring

The scoring system was distributed according to **(McGlone &Sadler, 2016)** to be 1 degree for the correct implemented items and 0 for the incorrect or incomplete items. Scores was classified into unsatisfactory practice level if the total score percentage was less than 85%, and satisfactory practice level if the score equal and more 85%. Score of 36 or more out of 42 will classified as satisfactory and score of 35 or less will fall under unsatisfactory.

Tool validity and reliability:

The tool was revised by a panel of five experts in the field of Medical- Surgical Nursing specialty related fields as thoracic surgery and then the necessary modification were done accordingly.

Coefficient of reliability of the evaluating tools was measured by Cronbach's α alpha test. The reliability scores of the knowledge and practice assessment tools were (0.876 and 0.896 respectively), which indicate high tool internal consistency.

Pilot Study:

A pilot study was carried out on 10% of the nurses under study over a period of one month, from the beginning of November 2022 to the beginning of December 2022. It was conducted on six nurses to test the feasibility and applicability of the tool, and the necessary modifications (such as clarifying questions, adjusting response options, or refining instructions) were made. The pilot study was excluded from the study sample as modifications were made to the tools.

II. Fieldwork

The study conducted on four phases (assessment phase, adapt phase, implementation phase and evaluation phase) from January 2023 to June 2023

Phase 1; Assessment phase: (to determine knowledge and practice gaps).

The level of nurses' knowledge and

practice assessed first using the tools (I & II) of data collection to obtain base line data. The educational program developed by the researcher based on the primary assessment of nurse's knowledge and practice, using the available recent resources and review of relevant literatures.

Phase 2; Adapt phase: (adapt knowledge to local context)

Section one: The educational booklet developed in simple Arabic language to support the educational program and enhance nurses' knowledge and practices. It's content based on the initial assessment of nurses' knowledge and skills, and a review of recent and relevant literature. The booklet begins with an introduction outlining the importance of the topic and the general objectives of the program. It includes sections on the definition and mechanism of action of the intra-aortic balloon pump (IABP), its indications, contraindications, potential side effects, and general guidelines for safe use.

Additionally, the booklet provides detailed instructions on basic nursing procedures when using the IABP, alongside practical application and evaluation methods. It concluded with a summary to reinforce key points. It designed as a comprehensive and accessible resource, the booklet aimed to equip nurses with the theoretical and practical knowledge needed to ensure safe and effective patient care.

Section two: The practice level was assessed using tool II and knowledge level assessed using tool I for the study group. Theoretical and practical content implemented and repeated according to the ability of nursing's understanding. Then the researcher provided each nurse with the designed illustrated booklet.

Phase 3: Implement the educational program

The educational program implemented for nurses in terms of sessions, with five sessions. Number of nurses in each session ranged from 3 to 5 nurses. The duration of each session were not exceeding half an hour, with extra 10 minutes for discussion and feedback. Only one group observed three times (assess before, and evaluate after introducing the educational program with one month, then after three months (follow-up).

For theoretical content

The theoretical contents were focus

on; anatomy and physiology of cardiovascular system, Principles and hemodynamic effects of IABP, indications, contraindications and complications of IABP. Each session was started by a summary of what has been taught during the previous session and the objectives of the topics. Feedback and reinforcement of education performed according to the nurses' needs to ensure their understanding. The sessions were implemented using power point presentations (CD), pictures, and discussion with availability of colored printed educational program.

The theoretical content of the program is organized into five structured sessions to provide a comprehensive understanding of the intra-aortic balloon pump (IABP). The first session begins with an overview of the anatomy and physiology of the cardiovascular system as it relates to the IABP, offering a foundational understanding of its mechanism of action and its role in cardiac care. The session has duration of 40 minutes and aims to orient participants to the program's aim, objectives, and rules. Additionally, it introduces key theoretical concepts related to the IABP. The session concludes with a summary to reinforce the material covered.

The second session, lasting 30 minutes, focuses on familiarizing participants with the hemodynamic effects of the intra-aortic balloon pump (IABP). The session begins with a summary of the previous session and progresses to an in-depth discussion of how the IABP reduces afterload and enhances coronary perfusion. It concludes with a summary to reinforce the key concepts covered. The third session, lasting 30 minutes, emphasizes the indications for using the intra-aortic balloon pump (IABP). The session begins with a summary of the previous session and provides a detailed discussion on the clinical scenarios that warrant the use of the IABP. It concludes with a summary highlighting the key indications for its use.

The fourth session, lasting 30 minutes, focuses on the contraindications for IABP use and examines potential complications, including vascular injuries, infection, and device malfunction. Strategies for preventing and managing these complications are also discussed. The session begins with a summary of the previous session and concludes with a summary emphasizing the contraindications and

potential complications associated with IABP use.

The final session, lasting 30 minutes, was dedicated to reviewing all topics covered throughout the program. It included case-based discussions to reinforce learning and emphasized the critical role of nurses in caring for patients with an intra-aortic balloon pump (IABP). The session also provided an opportunity to address participants' questions and clarify any uncertainties. Feedback and reinforcement were integrated to meet the learning needs of the nurses. Educational materials, including power point presentations, images, printed guides, and interactive discussions, were utilized to ensure an engaging and effective learning experience.

For practical content

The researcher was conducted using educational materials (photos and video).This was done on small sessions ranged from 3 to 5 nurses with a total of five sessions. The first session, lasting 40 minutes, began with an introduction to the program's objectives, including an overview of the key concepts to be covered. It focused on the steps required for preparing a patient for intra-aortic balloon pump (IABP) therapy, including infection control measures, sterile techniques, and the appropriate positioning of the patient. The session ended with a comprehensive summary of the patient preparation process, highlighting its significance in preventing complications and ensuring a safe and effective procedure.

The second session, lasting 30 minutes, began with a brief recap of the previous session and an introduction to the catheter insertion procedure. Nurses were trained for assistant doctor on the correct methods in safely inserting the IABP catheter, with an emphasis on adhering to protocols that minimize risks such as vascular injury and infection. The session ended with a summary of the key techniques for catheter insertion and a discussion of their importance in maintaining patient safety.

The third session, lasting 30 minutes, began with a recap of the previous session and a review of the IABP monitoring principles. It focused on training nurses to interpret hemodynamic data, identify waveform abnormalities, and adjust the device settings based on the patient’s condition. The session ended with a summary of monitoring techniques and a review of

how timely and accurate monitoring directly impacts patient outcomes, such as recovery rates, complications, and overall health status.

The fourth session, lasting 30 minutes, began with a summary of the previous session and an introduction to troubleshooting procedures for the IABP. Nurses were trained to respond to alarms, address device malfunctions such as loss of pressure, device disconnect, or failure of the pump, and manage complications such as vascular injuries or catheter displacement. The session ended with a recap of troubleshooting strategies and effective management of complications to ensure the patient's safety and the proper functioning of the device.

The fifth and final session, lasting 30 minutes, began with a review of all topics covered throughout the program. It focused on reinforcing the skills learned by engaging participants in case-based discussions and practical scenarios. Nurses were encouraged to apply their knowledge in simulated clinical situations. The session concluded with a detailed feedback session, summarizing key learning points and ensuring the nurses felt confident and well-prepared to care for patients with IABP therapy.

The practical component of the educational program carefully designed to ensure effective skill development and application. Small group sessions of 3 to 5 nurses conducted to allow for individualized attention and hands-on practice. Each session began with the researcher demonstrating essential nursing procedures related to caring for patients using the IABP. This done using a combination of photos and videos to ensure clarity and understanding. The demonstration focused on systematic guidance, highlighting critical points and best practices. The researcher observed the nurse practice using observational checklist before and after the program implementation. The researcher was completed the checklist while the nurse demonstrates assessment, different procedure on the patient.

After the demonstration, each nurse had the opportunity to practice (re-demonstrate) the procedures under the researcher's supervision. During this phase, the researcher used an observational checklist to assess the nurse's performance, including

their ability to assess patients and carry out the required actions accurately and safely. Immediate feedback provided to reinforce correct practices and address areas of improvement. Nurses who required additional support were give opportunities for further re-demonstration until they achieved the desired skills level. Each session lasted 30 minutes, with an additional 10 minutes for open discussion and feedback.

Phase 4: Evaluation phase

Evaluation of the educational program carried out to all nurses using the same study tools to evaluate the effect of implementing intra-aortic balloon pump educational program on critical care nurse's knowledge and practice after the implementation with one month post-test and after three months for the follow-up.

Ethical considerations

The research approval obtained from the scientific ethical committee in faculty of nursing Suez Canal University, under code 178-9-2022. The researcher clarified the objective and aim of the study to the nurses included in the study. The researcher assured maintaining anonymity and confidentiality of the collected data. Nurses informed about their rights to participate or withdraw from the study at any time. Additionally, patient involvement was considered during the education of nurses in clinical practice to enhance their learning experience.

Statistical design:

Data collected the questionnaires were coded, entered and analyzed using Statistical Package for the Social Sciences (SPSS Ver.26.). Descriptive statistics done using (number, percentage, mean and standard deviation).Chi-square test were doing to compare difference between variables and Pearson correlation between quantitative variables. P-value was be considered statistically significant when $p< 0.05$.

3. Results:

Results of the present study are presented in the following sequence:

Table (1): clarified that 90% of the studied nurses age ranged from 20 to 30 years with mean age of 27.35±2.254, 45% of nurses had technical institute in nursing, 89.9% had

a staff nurse position, and 56.7% of nurses had years of experience ranged between 1 to less than 5 years. Concerning the studied nurses' attendance of training programs related to IABP; 91.7% didn't attend any training courses related to IABP.

Table (2): illustrates that studied nurses' knowledge regarding IABP; in the pre educational program implementation, 69% demonstrated incorrect knowledge, while only 31% exhibited correct knowledge. Following the intervention, a significant improvement was observed, with 86.7% achieving correct knowledge in the post educational program implementation. However 73.3% maintaining correct knowledge.

Figure (2) shows that, (35%) of the studied nurses had satisfactory level of practice within pre compared to 86.7% in post after implementation of the educational program, while in follow up was (76.7%) of the critical care nurses have satisfactory level of practice at the follow up phase.

Table (3) shows a highly statistically significant relationship between nurses' knowledge and socio demographic factors such as age, educational level, job position, and training courses, with p-values of 0.02, 0.01, 0.001, and 0.01, respectively.

Table (4) indicates a statistically significant relationship between nurses' knowledge and their years of experience, particularly Years of experience in the intensive care unit, with p-values of 0.04 and 0.001, respectively.

Table (5) shows that, there was a statistically significant positive correlation between the studied nurses total knowledge and practice with p-value=0.000*.

4. Discussion

The intra-aortic balloon pump is a mechanical hemodynamic support device that uses counter pulsation to provide temporary circulatory assistance. An IABP is used to manage cardiogenic shock, refractory unstable angina, acute myocardial infarction, and refractory or intractable ventricular tachycardia. The device may also use to support patients before and after cardiac surgery and to serve as a bridge to advanced therapies such as a left ventricular assist device or transplant **(Garg, 2023).**

The intra-aortic balloon pump utilization has increased over three fold since the 2018 policy change with improved

waitlist outcomes and comparable post- heart transplant survival. Thus, bridging patients to heart transplant with IABPs appears to be an effective strategy in the current era **(Maitra et al., 2023).**

Therefore, the present study aimed to evaluate effect of educational program regarding care of patients with intra-aortic balloon pump on critical care nurses' knowledge and practice. To fulfill the objective of this study, the discussion of the current study findings will cover four main parts in the following sequence: Part I, nurses' demographic characteristics of the studied nurses; Part II, nurses' level of knowledge regarding IABP; Part III, nurses' level of practice regarding IABP and Part V, correlation between the study variables.

Regarding the demographic characteristics of the studied nurses, the finding of the current study showed that the majority of the nurses' ages ranged from 20 to less than 30 years, with a mean age of 27.35 ± 2.254 years. This finding aligns with the study conducted by **Amin et al. (2023)** titled "Nurses' Knowledge, Attitude, and Safety Interpretation of Waves for Patients Connected with Intra-Aortic Balloon Pump." in the cardiothoracic intensive care units at Ain-Shams University and Nasser Institute for Research and Treatment and found that more than three-quarters of the studied nurses were aged 20 to less than 30 years.

From the researcher's perspective, this age distribution is likely due to the fact that many nurses in this group are recent graduates who are at the beginning of their professional journey. Another possible explanation could be the increasing trend of younger nurses choosing to specialize in high-acuity areas, such as critical care, due to the growing demand for skilled professionals in these settings and the appeal of gaining early, intensive experience.

The results of this study contrast with those found by **Mohamed et al. (2023)** in a research titled "Effect of Educational Guidelines on Nurses' Performance regarding Caring for Patients with an Intra-Aortic Balloon Pump." Conducted in the Cardio-Thoracic unit at Benha University and the open-heart units at Nasser Institute Hospitals, their study revealed that less than half of the studied nurses were aged between 20 and less than 30 years.

With regard to educational level, the

current study revealed that slightly less than half of the studied nurses had a technical institute of nursing degree. From researcher point of view; these institutes provide more accessible and shorter educational pathway compared to universities, which makes them a popular choice for individuals seeking to enter the profession quickly. Additionally, socioeconomic factors and limited access to university programs in some areas may influence this trend.

This result was in agreement with the study by **Ghafoor & Bilal, (2022),** titled "Validity of Standardized Guidelines of Intra-Aortic Balloon Pump Care among Nurses on Hospital Stay of Cardiac Patients." Conducted in the Intensive Care Units in Lahore, Pakistan, their research revealed that less than half of studied nurses had a technical institute nursing degree, while the more than half of them had higher education. This result was disagreed with **Mohamed, (2023)** who revealed that the majority of nurses had a bachelor's degree.

As regards to years of experience, the current study revealed that more than have of the studied nurses had years of experience ranged from 1 < 5 years old in the nursing field, and nearly three - quarters had yearly experience ranged from 1 < 5 years in ICU, and the majority of nurses studied not attend training programs about IABP. From researcher point; this finding can be linked to the demographic characteristics of the nurses, as most of nurses' were aged between 20 and 30 years, indicating that they are recent graduates and still in the early stages of their professional careers. Their limited experience and lack of exposure to advanced training programs like IABP could be attributed to their relatively short time in the workforce.

This result aligns with **Neelavathi, (2018),** who conducted a study titled "Effectiveness of Capacity Building Program Regarding Care of Patients with Intra-Aortic Balloon Pump upon the Level of Knowledge and Practice among Nurses." This study carried out at Apollo Main Hospital & Apollo Specialty Hospital in Chennai, and revealed that more than half of the nurses had up to two years of experience in the ICU, with most of them having previous experience in the care of patients with IABP.

This result disagrees with the study by **Ghafoor et al. (2022)** titled "The Effect of Teaching Program on Knowledge and

Caring Practice of Intra-Aortic Balloon Pump Patient among ICU Staff Nurses" conducted in Pakistan. The study revealed that the majority of nurses had more than 5 years of experience in the ICU, and most of them had 5 years of experience in caring for patients with IABP.

As regarding to the total knowledge of nurses, the current study revealed that more than one- quarter of the studied nurses had a satisfactory level of knowledge in the pre educational program implementation. This might be related to a lack of training about IABP, non-availability of education resources in ICU and CCU units, and non-availability of access for knowledge refreshment. In addition, nurses experience exhaustion and burnout due to long work hours and an increased workload, which hinders their ability to read and update their knowledge

The total level of nurses' knowledge improved to more than three-quarters after the application of the educational program after one month. However, in the follow-up, the knowledge level declined to just fewer than three-quarters. This result agrees with the findings of **Mohamed et al. (2023),** who reported that more than three-quarters of nurses had a satisfactory level of knowledge post-application of the educational program. However, it disagrees with the same study's pre educational program implementation results, which showed that more than one-third of the nurses had a satisfactory level of knowledge, and in the follow-up, more than three-quarters maintained a satisfactory level of knowledge.

As regard to total level of practice, the current study showed that more than half of the studied nurses exhibited an unsatisfactory level of practice during the pre-program intervention phase. However, after the implementation of the educational program, the majority of the studied nurses' demonstrated a satisfactory level of practice after implementation of the program with one- month. Furthermore, in the follow-up, more than three-quarters of the critical care nurses maintained a satisfactory level of practice. This result might be due to the effect of explaining the correct steps of Intra-aortic balloon pump nursing procedures in the educational program with colored pictures illustrating each step using data show.

These findings were consistent with the results of **Mohamed et al. (2023),** who reported that the majority of studied nurses achieved a satisfactory level of practice post-educational program implementation with one-month and in the follow up phase. However, this study disagreed with **Rushdy et al. (2015)**, in pretest results, which revealed that the majority of nurses initially had an unsatisfactory level of practice.

Regarding to relation between total nurses' knowledge and demographic characteristics post educational program implementation, this study illustrated that there was a highly statistically significant relationship between nurses' knowledge and socio demographic factors such as age, educational level, job position, and training courses. This study was in disagreement with **Neelavathi, (2018),** who revealed that there was no significant association between pre and post program implementation level of knowledge and other demographic variables of nurses such as age, educational level, ICU experience and previous experience of IABP patient care.

From a researcher's perspective, younger nurses, often recent graduates, may benefit more from such programs as they are in the foundational phase of building their skills. Similarly, higher educational levels and advanced job positions are typically associated with a deeper theoretical foundation and more clinical exposure, enabling these nurses to grasp complex concepts more effectively. Additionally, participation in training courses directly enhances knowledge by bridging gaps between theory and practice, emphasizing the importance of continuous professional development.

Regarding to relation between total nurses' practice and demographic characteristics, this study illustrated that there was a highly statistically significant relation between nurses' practice, years of experience in nursing and years of experience in the intensive care unit in pre and post educational program implementation phase. From the researcher's perspective, these results emphasize that practical experience plays a key role in shaping nursing practice. Nurses with more years of experience in general nursing or ICU settings tend to develop stronger clinical skills and deeper understanding of patient

care through hands-on practice. However, the significant improvement in practice post-educational program implementation suggests that experience alone is not sufficient. Structured educational programs provide nurses with updated knowledge, evidence-based practices, and specialized skills that enhance their clinical performance regardless of their initial experience level.

This study was in disagreement with **Neelavathi, (2018),** who revealed that there was no significant association between pretest and posttest level of practice regarding IABP care and the nurses' demographic variables namely age, gender, educational level, years of ICU experience and previous experience of care of patient with IABP. Similarly this study is in disagreement with **Rushdy et al. (2015),** who revealed that there was no significant relation between total practice and gender or age category of the studied nurses.

As regarding the correlation between knowledge and practice, the finding of this study revealed positive correlation between knowledge and practice score obtained by critical care nurses receiving the teaching program. This reflects the importance of integration between theory and practice .In the same line **AlyMahgoub & Hafez, (2017),** revealed statistical significant positive change in nurses' level of knowledge and practice, and **Ghafoor et al. (2022**), who found a positive significant correlation between nurses' knowledge and performance.

5. Conclusion:

A statistically significant improvement in nurses' total knowledge and practices levels after implementing the educational program.

Throughout the study, there was a noticeable enhancement in the knowledge levels of nurses regarding IABP therapy, as the percentage of nurses with satisfactory knowledge increased dramatically from one-third before the educational program implementation to nearly nine-tenths after the intervention with one month, and maintained at over two-thirds in the follow-up phase.

Distribution of the studied nurses' total level of practice about IABP shows that approximately one-quarter of the studied nurses had unsatisfactory level of practice

within pre educational program implementation compared to four-fifths after implementation of the educational program, while in follow up was seven-tenths of the critical care nurses have satisfactory level of practice at the follow up phase.

These results underscore the effectiveness of targeted training programs in significantly improving the skills of nurses, thereby promoting better patient outcomes. The substantial rise in satisfactory knowledge and practice levels highlights the critical need for ongoing education and support to ensure high standards of care in critical cardiac settings.

6. Recommendations:

Based upon the findings of the present study, the following recommendations can be concluded:

1. Periodic evaluation of nurses' knowledge and practice regarding IABP.
2. Establish regular, mandatory training courses and workshops theoretical and practical focus on the care of patients with advanced medical devices like the IABP to improve the quality and safety of patient.
3. Establish mentoring system where experienced nurses provide guidance and support to less experienced colleagues in managing IABP patients to reinforce learning and improve clinical practice.

Tables and Figures

Table (1): Frequency and percentage distribution of demographic data for the studied nurses (n=60).

Demographic data	Studied nurses (n = 60)	
	N	**%**
Age		
• From 20 to > 30	54	90
• from 30 to > 40	4	6.7
• From 40 to > 50	2	3.3
Mean ± SD	27.35±2.254	
Gender		
• Male	25	41.7
• Female	35	58.3
Marital status		
• Single	24	40
• Married	36	60
• Widow	0	0
• Divorced	0	0
Educational level		
• Bachelor degree of nursing	8	13.3
• Technical institute of nursing	27	45
• Diploma nursing	23	38.3
• Master degree nursing	2	3.3
Job		
• Charge nurse	6	11.1
• Staff nurse	54	89.9
Years of experience in the field of nursing		
• From 1 year to 5 years	34	56.7
• from5 years to 10 years	22	36.7
• More than 10 years	4	6.6
Years of experience in the intensive care unit (ICU)		
• From 1 year to 5 years	43	71.7
• from5 years to 10 years	15	25
• More than 10 years	2	3.3
Attendance of training programs related to IABP		
• Yes	5	8.3
• No	55	91.7

Table (2): Distribution of the studied nurses' total knowledge levels regarding IABP throughout the study phase (n=60).

Level of knowledge	Nurses Knowledge						*x2*	P-Value
	Pre		Post		Follow up			
	N	%	N	%	N	%		
Un Satisfactory Satisfactory	41 19	69 31	8 52	13.3 86.7	16 44	26.7 73.3	18.720	0.000*

**: Significant at P ≤ 0.05*

Figure (1): Distribution of the studied nurses' total level of practice regarding IABP throughout the study phase (n=60).

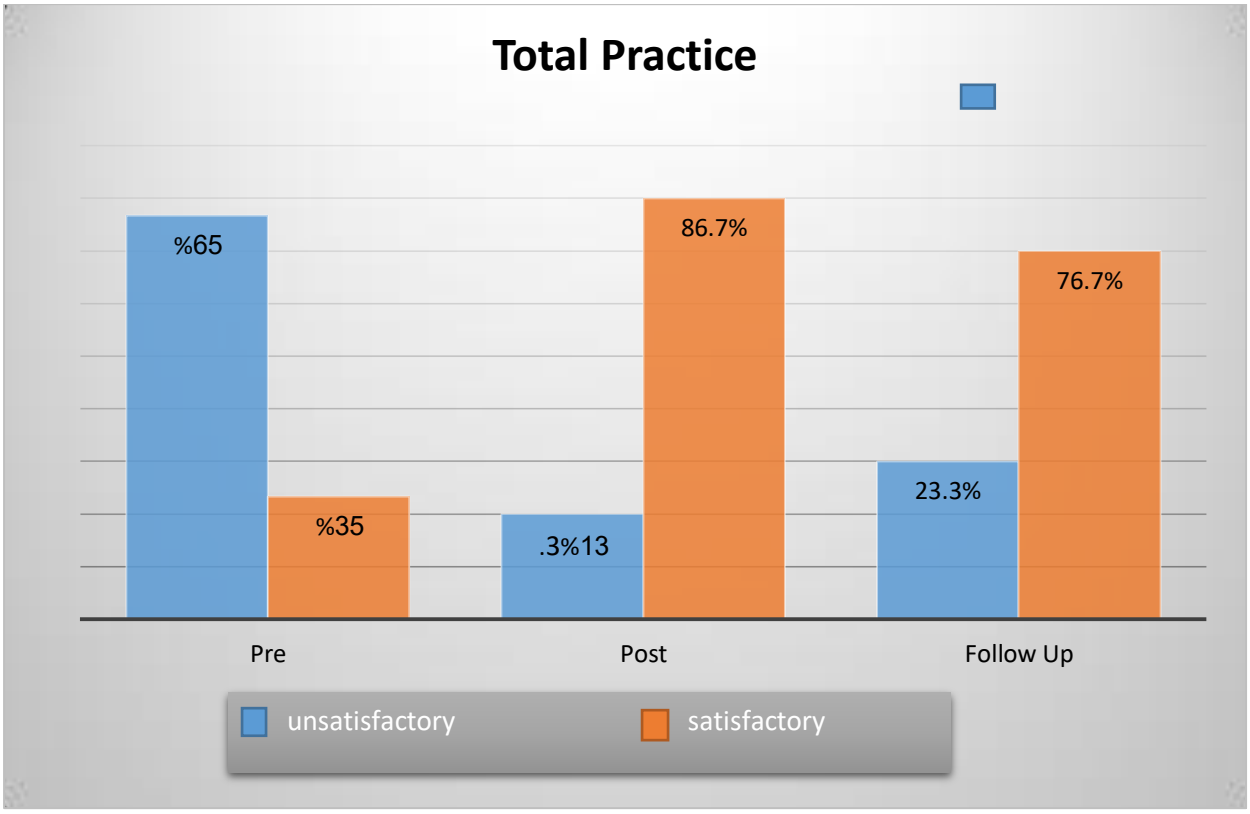

Table (3): Relation between total nurses' knowledge post educational program and demographic characteristic

Demographic characteristic	Nurses' Knowledge *post*				*x2*	*P*-value
	Un satisfactory (n=8)		Satisfactory (n=52)			
	No	%	No	%		
Age:						
• From 20 to > 30	6	75	48	92.3		
• from 30 to > 40	1	12.5	3	5.8	1.102	0.02*
• From 40 to > 50	1	12.5	1	1.9		
Gender:						
• Male	5	62.5	20	38.5	1.017	0.686
• Female	3	37.5	32	61.5		
Marital status:						
• Single	6	75	18	34.6	0.625	0.319
• Married	2	25	34	65.4		
Educational level:						
• Bachelor degree of nursing	2	25	6	11.5		
• Technical institute of nursing	2	25	25	48	2.029	0.01*
• Diploma nursing	3	37.5	20	38.5		
• Master degree nursing	1	12.5	1	1.9		
Job:						
• Charge nurse	2	25	4	7.7	1.203	0.001*
• Staff nurse	6	75	48	92.3		
Years of experience in the field of nursing:						
• From 1 year to 5 years	5	62.5	29	55.8	0.282	0.605
• from5 years to 10 years	2	25	20	38.5		
• More than 10 years	1	12.5	3	5.7		
Years of experience in ICU:						
• From 1 year to 5 years	4	50	39	75	1.177	0.470
• from5 years to 10 years	3	37.5	12	23.1		
• More than 10 years	1	12.5	1	1.9		
Attendance of training programs related to IABP						
• Yes	3	91.7	2	3.8	4.120	0.01*
• No	5	8.3	50	96.2		

: Significant at P ≤ 0.05

Table (4): Relation between total nurses' practice post education program and demographic characteristic

Demographic characteristic	Nurses' practice post				*x2*	P-value
	Un satisfactory (n=8)		satisfactory (n=52)			
	No	%	No	%		
Age:						
• From 20 to > 30	6	75	48	92.3	4.033	0.230
• from 30 to > 40	1	12.5	3	5.8		
• From 40 to > 50	1	12.5	1	1.9		
Gender:						
• Male	7	87.5	18	34.6	0.606	0.579
• Female	1	12.5	34	65.4		
Marital status:						
• Single	3	37.5	21	38.9	0.278	0.456
• Married	5	62.5	31	59.6		
Educational level:						
• Bachelor degree of nursing	1	12.5	7	13.5	3.856	0.277
• Technical institute of nursing	3	37.5	24	46.1		
• Diploma nursing	3	37.5	20	38.5		
• Master degree nursing	1	12.5	1	1.9		
Job:						
• Charge nurse	2	25	4	7.7	7.954	0.417
• Staff nurse	6	75	48	92.3		
Years of experience in the field of nursing:						
• From 1 year to 5 years	4	50	30	57.7	4.070	0.04*
• from5 years to 10 years	3	37.5	19	36.5		
• More than 10 years	1	12.5	3	5.8		
Years of experience in the intensive care unit						
• From 1 year to 5 years	5	62.5	38	73.1	3.764	0.001*
• from5 years to 10 years	2	25	13	25		
• More than 10 years	1	12.5	1	1.9		
Attendance of training programs related to IABP						
• Yes	3	37.5	2	3.8	0.606	0.579
• No	5	62.5	50	96.2		

***: Significant at P ≤ 0.05**

Table (5): Correlation between total nurses' knowledge and total practice levels

	Total knowledge	
Total practice	**relation Coefficient r**	***P*-value**
	0.236	0.000*

***: Significant at P ≤ 0.05**

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