

Effect of Educational Program on Nurse's Performance Regarding High-Risk Patients With Infective Endocarditis

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Abstract

Background

Infective endocarditis (IE) is a serious infection affecting the inner layer of the heart that is linked to a wide range of complications. Its effective treatment relies heavily on eliminating microorganisms through targeted antimicrobial medications. Patients with congenital heart disease, prosthetic heart valves, or a previous history of IE are considered high-risk categories.

Aim

The present study aimed to evaluate the effect of educational program on nurse's performance regarding high-risk patients with infective endocarditis.

Design: Quasi experimental (one-group pre-/post-test) research design. **Sample:** A convenient sample of (40) nurses was conducted that dealing with cardiac patient. **Setting:** The study was performed in cardiac department at Aswan University Hospital. **Tools:** Tool (I): Questionnaire interview Sheet divided into two parts, Part (1) Personal characteristics data Part (2): Nurse's Knowledge Concerning Infective Endocarditis (IE) Patient Sheet, Tool (II): Nurses' practice Observational Checklist to evaluate nurses' practices concerned to infective endocarditis. **Results:** The nurses' total knowledge score increased from 37.5% to 75.0% post educational program implementation. In addition to rising their practice from 55.0% to 82.5% post educational program.

Conclusion:

The educational program implementation leads to a significant improvement in nurses' knowledge and practice.

Recommendation

Provide regular educational programs for nurses to increase their knowledge and skills in caring for high-risk patients having infective endocarditis.

Keywords: Educational program, High-risk patients, Infective endocarditis, Nurses' performance.

Introduction

Infective endocarditis refers to an inflammatory infection targeting the heart's internal lining. This condition typically develops when bacterial pathogens penetrate the circulatory system, subsequent colonizing the endocardium, cardiac valves, or adjacent blood vessels. (American Heart Association 2024). IE can be categorized in several ways, including by its clinical progression (acute or subacute), the valve type participating (native or prosthetic), the number of valves influenced, the mode of acquisition (community-acquired, healthcare-associated, or associated with intravenous drug use), and the causative microorganism (Apolinário et al., 2022).

Endocarditis is serious inflammatory disease that occurs due to many causes. Staphylococci, Enterococci, and Streptococci organisms are the most common cause of all IE cases; Staphylococcus aureus is responsible for 50% of all healthcare associated IE cases. only 1% of patients have fungal infections that cause IE, and these infections typically occur from systemic aspergillus and candida infections in immunocompromised individuals. (Slouha et al., 2023).

High-risk populations associated with the development of infective endocarditis (IE) include degenerative valvular disease, recent invasive procedures performed within the preceding 60 days, intravenous drug administration, congenital heart disorder, and the presence of long-term intravenous access devices. Generally, people who are more susceptible to bacterial infections such as those who are immunocompromised, undergo dental procedure, have prosthetic heart valves are more likely to experience bacterial adhesion (Kuo& Tsai 2023)

Endocarditis complications can lead to various clinical issues. Congestive heart failure, myocardial infarction, and cardiac arrhythmia are the primary cardiac complications resulting from infective endocarditis. In intravenous drug users, it frequently causes pulmonary issues, such as pneumonia, lung abscesses, and respiratory failure. Additionally, renal infarction, glomerulonephritis, and acute interstitial nephritis represent typical renal complications, while embolization and systemic spread of the infection represent critical generalized complications (Atia et al., 2022).

Nurses maintain an essential role in providing care and managing treatment. Their key responsibilities include monitoring vital signs and promptly identifying early indicators of difficulties, like heart failure, embolic events, and septic shock, particularly in high-risk patients. Nurses are also responsible for administering prescribed intravenous antibiotics, ensuring accurate dosing and appropriate timing, and observing patients for any adverse effects. Furthermore, adherence to strict aseptic techniques throughout all processes and intravenous therapy is essential to minimize the risk of additional infections (Abd-Elftah, 2025).

Elevated mortality rates and preventable complications often arise from delayed diagnosis or an underestimation of disease severity. So, early detection and accurate risk assessment of IE are crucial (McHugh et al., 2025).

Educational program is vital for nurses managing patients at great risk of infective endocarditis to enhance nurses' performance in providing optimal patients care and helps protect them from contracting infective endocarditis. Furthermore, this educational program is crucial for improving patient health in order to lower mortality rates, hospital readmissions, and the risk of major complications.

Significance of the study

Globally, infective endocarditis (IE) continues to be a complex medical condition connected with high patient morbidity and mortality rates. According to Vinod et al. (2025), the estimated in-hospital mortality rate ranges between 17% and 20%, while the 1-year mortality rate reaches up to 40%, alongside a 30-day readmission rate of 13.8%. Furthermore, these morbidity and mortality rates may escalate even further when taking into account additional IE-related complications.

Data from Egyptian registries indicate a relatively high proportion of culture-negative infective endocarditis (IE) cases. However, there remains a limited amount of published evidence describing the clinical and epidemiological characteristics of IE within the Egyptian population. Nurses serve as frontline healthcare providers who play a crucial role in detecting patients at elevated risk and implementing preventive measures for high-risk infective endocarditis (IE) (Atia et al., 2022).

Aim of the study:

To evaluate the effect of educational program on nurse's performance regarding high-risk patients with infective endocarditis.

Research Hypotheses

H1: Nurses' knowledge regarding high-risk patients with infective endocarditis will be enhanced after implementation of the educational program.

H2: Nurses' Practice regarding high -risk patients exhibiting infective endocarditis will be enhanced after application of the educational program.

Subjects and Methods

Research Design:

A quasi-experimental (one-group pre-/post-test) research design was used.

Setting:

The study was conducted in Cardiac Department at Aswan University Hospital.

Type of sample & Sample size:

A convenience sample of nurses working in the previously mentioned setting. The entire nurses (40) that dealing with

cardiac patient was included in this study.

Tools of data collection:

Data was collected employing two tools were being developed and applied by the researcher.

Tool (I): Questionnaire Interview Sheet:

This tool was developed by the researcher in accordance with recent and relevant literature (Atia et al., 2022 & Abd-Elftah, 2025) to collect personal characteristic data and measure nurses' knowledge about infective endocarditis, which contained two parts.

Part (1) Personal characteristics data of studied nurses and consisted of six items like nurses' age, sex, marital status, years of experience, educational level and previous training about care of patients with infective endocarditis.

Part (2): Nurse's Knowledge Concerning Infective Endocarditis (IE) Patient Sheet: This part was employed to estimate nurses' knowledge associated with infective endocarditis that consists of 18 questions, including (definition, causes, types, clinical manifestations, risk factors, diagnostic and lab examinations, management, complications and nursing education).

Scoring system:

Regarding to nurses' knowledge score method, it consisted of 18 questions, each question included a set of response options; a correct response was awarded one point, whereas an incorrect or omitted response received a score of zero. The total scores were added up and converted into percentage: the total nurses' knowledge was deemed satisfactory if percent score $\geq 75\%$ and unsatisfactory if it $< 75\%$. (Abd-Elhai et al., 2023)

Tool (II): Nurses' practice Observational Checklist:

This tool was developed by researcher based on reviewing related and recent literature to evaluate and estimate nurses' proficiency about infective endocarditis, this tool was adjusted from (Atia et al., 2022) and included 4 sections:

Section (1): included 5 items about different measures to decrease body temperatures.

Section (2): included 5 items about nurses' measures to relief dyspnea.

Section (3): included 5 items about nurses' measures for safe medication administration.

Section (4): included 9 items addressing nursing preventive measures for complications such as deep venous thrombosis, systemic infection and other difficulties.

Scoring system:

It consisted of (24 items), with each items had a group of answer points, correct answer was assigned one mark, whereas an incorrect or missing answer was assigned zero. The total scores were converted into a percentage as the following: the practice was deemed satisfactory if the percentage was $\geq 75\%$ and unsatisfactory if it was $< 75\%$. (Abd-Elhai et al., 2023)

Administrative design

An official letter seeking permission to carry out the study was forwarded by the Dean of the Faculty of Nursing at Aswan University to the Director of Aswan University Hospital. Following the Director's approval, administrative clearance was obtained from the Head of the Cardiology Department. This correspondence outlined the study's title and aims, and included copies of the data collection tools.

Ethical Considerations and Human Rights

An official approval to execute the study was acquired from Faculty of Nursing ethical committee with IRB number (3-5-2025). The purpose of the study was clearly explained to all participants prior to administering the research tools in order to build their trust and confidence. Verbal informed consent was obtained from every participant, ensuring their right to take part voluntarily and to withdraw at any time if they wished. The study involved no physical, psychological, or social risks to the participants. All collected data were handled with strict confidentiality and each participant was informed in advance about the scheduled time of the visit.

Operational design.

Validity:

It was done by a jury of three expertise in the field of medical surgical nursing, the content validity of the study tool was assessed, revised for clariting, relevance, comprehensiveness, understandable, applicable and accordingly needed modifications was done.

Reliability:

The Cronbach's alpha value of the nurses' knowledge is (0.88), nurses' practice is (0.83).

Pilot study:

A pilot study was executed at the end of June 2025 on 10% of the sample (n = 4) to evaluate the clarity of the research tools and assessment the time required for data collection. Because the pilot findings indicated that no modifications were needed, these four participants were comprised in the final study sample.

Field work:

The actual fieldwork for the data collection process lasted five months to complete, commencing at the beginning of July 2025 and ending at the end of November 2025. Three phases for data collection were used: assessment& planning phase, implementation phase, and evaluation phase.

Phase I: Assessment &Planning phase

- In this phase, the researcher started by introducing herself to the nurses to gain their approval and involvement in the research, then the researcher offered a clear explanation regarding goals, nature and objective of the research. The nurses were expressly informed that all their data would be kept confidential, and that they had the opportunity to withdraw from the study at any period.
- The researcher worked 3 shifts per week, two morning shifts from (9 am to 3 pm) and one afternoon shift from (4 to 9 pm).
- Preparation of educational program booklet about (improving nurses' performance regarding high-risk patients with infective endocarditis) were done during this phase based on related literature after collecting comprehensive data about nurses including (level of knowledge, practice and attitude), which helping in identifying nurses learning needs and appropriate implementation of educational program for nurses
- Also, in this phase, the researcher prepared teaching place, teaching media, methods and aids such as (pictures, videos and power point).

Phase II: Implementation phase

- According to the evaluation and planning phase the researcher conducted six interviews with each nurse and educational program was implemented through sessions held in (training room, nursing room). In coordination with the department director and nurse manager.
- The language used was tailored to match the nurse's educational level also motivation and positive reinforcement were applied to encourage active participation in the study.
- Each session started with brief summary of the preceding session and an introduction to the objective of new one, A total of six interviews was conducted:
- **First interview:** Each nurse was individually interviewed to complete the tools sheet designed to assess their demographic data, knowledge and attitude (tool I part 1&2, III), finally the researcher directly noted each nurse throughout her work to assess and evaluate their practice related to infective endocarditis by practice observational check list (tool II).
- **Second interview (First session of educational program):** This interview included theoretical component about infective endocarditis and lasted for (30 minutes). It included the definition, classifications, clinical manifestations, causes, risk factors, laboratory tests, diagnostic techniques, and potential complications of infective endocarditis. Then the researcher concluded the session by summarizing the main points and obtaining feedback from the nurses.
- **Third interview (Second session):** This interview started with brief recap of the previous session and an introduction

to the objective of current one. It included a practical section on infective endocarditis and lasted for (30 minutes). The discussion covered nursing interventions to manage fever, reduce dyspnea and ensure safety procedures during administering medication. Then the researcher concluded the session by summarizing the main points and obtaining feedback from the nurses.

- **Fourth interview (Third session):** This interview began with brief recap of the previous session, followed by a continuous practical section on infective endocarditis, and it lasted for (30 minutes). It included nursing interventions aimed to maintaining immobilization and prevention of systemic embolism. Then the researcher concluded the session by summarizing the main points and obtaining feedback from the nurses.
- **Fifth interview (Fourth session):** This interview began with brief recap of the previous session, which included continuous practical section on infective endocarditis and lasted for (30 minutes). It also discussed nursing intervention to prevent deep vein thrombosis, as well as prophylactic nursing practice to decrease the complications of infectious endocarditis. Then the researcher concluded the session by summarizing the main points and obtaining feedback from the nurses.
- **Sixth and Last interview (Fifth session):** The researcher concluded the educational program according to the nurses need by summarizing content, reinforcing the information learned, addressed and answered any questions asked by the nurses and providing feedback through open discussions.
- The researcher immediately evaluated nurses' knowledge and practice after educational program implementation by using collection data tools (tool I part (2), tool II).
- Finally, the researcher thanked the nurses for their cooperation and inquired about their opinion on educational program and its benefits, which lasted for (20 minutes).

Phase III: Evaluation phase

This phase focused on evaluating the efficiency of the educational program and determining the extent to which the study objectives were achieved. It involved a comparative analysis of pre and post test results to measure the educational program's effect on nurses' performance concerning high-risk patients having infective endocarditis.

Statistical design

The obtained data was arranged and interpreted using (SPSS) version 30 along with Microsoft Excel 2016. Descriptive statistics were applied. Numerical (quantitative) variables were described using mean values and standard deviations (SD), while categorical (qualitative) data were summarized using frequencies and percentages. The following tests were used: McNemar's Test was employed to estimate the distinction among qualitative variables. Marginal Homogeneity (MH) test was employed to estimate the variation among non-parametric paired qualitative data when variables had more than two categories. Chi-Square (χ^2) independency test was employed to evaluate the relationship between the independent categorical variables. Paired t test (t) was used to test whether the variation among the two related observations of group is statistically significant or not Spearman correlation coefficient (r) was applied to estimate the Strength and direction of correlation among two ranked variables. When the P-value > 0.05, it is deemed significant (S).

Results:

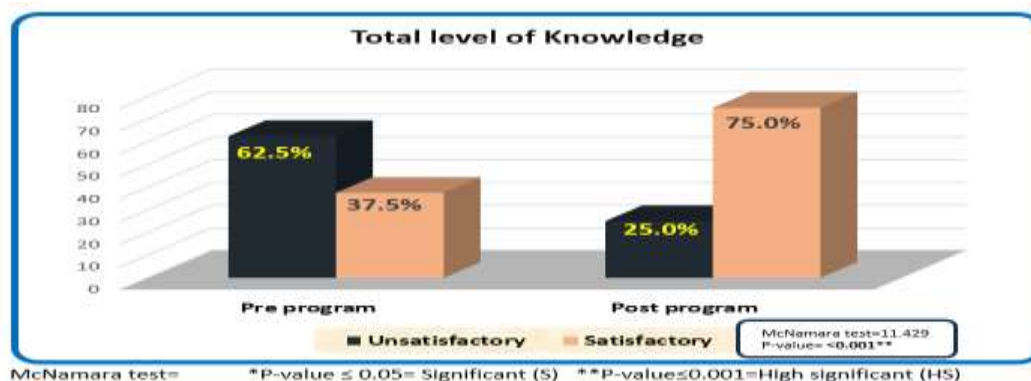


Figure (1): Total Knowledge Level regarding infective endocarditis pre and post implementing the educational program

(n=40).

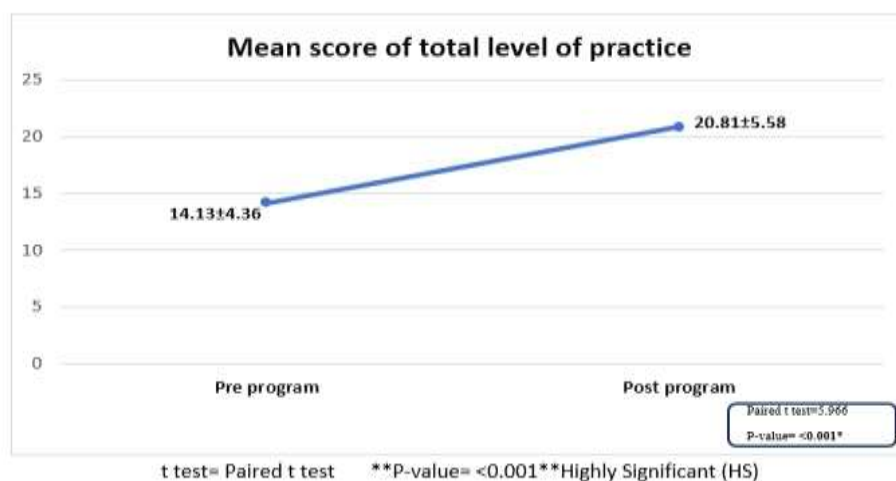


Figure (2): Mean score of total practice level concerning infective endocarditis pre and post implementing the educational program (n=40).

Table (1): Relationship between total knowledge level and the demographic data pre and post implementing the educational program (n=40).

Personal characteristics		Total level of knowledge									
		Pre-program				X ² & P- value	Post-program				X ² & P- value
		Unsatisfactor		Satisfactory			Unsatisfactor		Satisfactor		
		y					y				
		N	%	N	%		N	%	N	%	
Age (in years)	> 25	15	37.5	8	20.0	3.849 & 0.427	5	12.5	18	45.0	7.990 & 0.092
	25 ≥ 34	17	17.5	2	5.0		1	2.5	8	20.0	
	35 ≥ 44	2	5.0	3	7.5		3	7.5	2	5.0	
	45 ≥ 54	1	2.5	1	2.5		0	0.0	2	5.0	
	≤ 55	0	0.0	1	2.5		1	2.5	0	0.0	
Sex	Male	10	25.0	4	10.0	0.733 & 0.392	3	7.5	11	27.5	0.147 & 0.702
	Female	15	37.5	11	27.5		7	17.5	19	47.5	
Marital status	Single	15	37.5	8	20.0	0.171 & 0.680	4	10.0	19	47.5	1.671 & 0.196
	Married	10	25.0	7	17.5		6	15.0	11	27.5	
Years of experience	> 1 year	7	17.5	8	20.0	4.770 & 0.189	6	15.0	9	22.5	4.292 & 0.232
	1 ≥ 5 years	11	27.5	3	7.5		1	2.5	13	32.5	
	6 ≥ 10 years	6	15.0	2	5.0		2	5.0	6	15.0	
	11 ≥ 15 years	1	2.5	2	5.0		1	2.5	2	5.0	
Educational level	Technical institute of Nursing	16	40.0	11	27.5	0.372 & 0.042 *	6	15.0	21	52.5	0.342 & 0.051*
	Bachelor of Nursing	9	22.5	4	10.0		4	10.0	9	22.5	
Previous training on IE care	Yes	7	17.5	4	10.0	0.008 &	2	5.0	9	22.5	0.376 &
	No	18	45.0	11	27.5		8	20.0	21	52.5	

						0.024 *					0.040*
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χ^2 test= Chi-Square test P-value > 0.05= Non-significant (NS) *P-value $\leq$ 0.05= Significant (S) **P-value $\leq$ 0.001=High significant (HS)

Table (2): Relationship between total practice level and the demographic data pre and post educational program implementation (n=40).

Personal characteristics		Total level of practice									
		Pre-program				X ² & P- value	Post-program				X ² & P- value
		Unsatisfactor y		Satisfactory			Unsatisfactor y		Satisfactor y		
		N	%	N	%		N	%	N	%	
Age (in years)	> 25	12	30.0	11	27.5	2.984 & 0.560	3	7.5	20	50.0	2.845 & 0.584
	25 ≥ 34	5	12.5	4	10.0		2	5.0	7	17.5	
	35 ≥ 44	2	5.0	3	7.5		2	5.0	3	7.5	
	45 ≥ 54	2	5.0	0	0.0		0	0.0	2	5.0	
	≤ 55	1	2.5	0	0.0		0	0.0	1	2.5	
Sex	Male	9	22.5	5	12.5	0.750 & 0.386	3	7.5	11	27.5	0.230 & 0.417
	Female	13	32.5	13	32.5		4	10.0	22	55.0	
Marital status	Single	14	35.0	9	22.5	0.753 & 0.385	2	5.0	21	52.5	2.906 & 0.088
	Married	8	20.0	9	22.5		5	12.5	12	30.0	
Years of experience	> 1 year	8	20.0	7	17.5	3.102 & 0.037 *	1	2.5	14	35.0	6.531 & 0.045 *
	1 ≥ 5 years	10	25.0	4	10.0		3	7.5	11	27.5	
	6 ≥ 10 years	3	7.5	5	12.5		1	2.5	7	17.5	
	11 ≥ 15 years	1	2.5	2	5.0		2	5.0	1	2.5	
Educational level	Technical institute of Nursing	18	45.0	9	22.5	4.569 & 0.033 *	2	5.0	25	62.5	5.861 & 0.018 *
	Bachelor's of Nursing	4	10.0	9	22.5		5	12.5	8	20.0	
Previous training on IE care	Yes	6	15.0	5	12.5	0.001 & 0.027 *	2	5.0	9	22.5	0.944 & 0.005 *
	No	16	40.0	13	32.5		5	12.5	24	60.0	

χ^2 test= Chi-Square test *P-value $\leq$ 0.05= Significant (S) **P-value $\leq$ 0.001=High significant (HS)

Table (3): Correlation matrix between knowledge and practice among the studied nurses pre and post implementing the educational program (n=40).

Items	Phase	Total level of knowledge		Total level of practice	
		R	P-value		
Total level of knowledge	Pre	-	-	0.279	0.024*
	Post	-	-	0.379	0.016*

r= Spearman correlation coefficient *P-value ≤ 0.05= Significant (S)

Figure (1): Displays a highly statistically significant distinction was observed in nurses' knowledge level between pre and post educational program with (P-value= <0.001), demonstrating the efficiency of the educational program implementation.

Figure (2): Demonstrates that the mean score of total level of practice was 14.13±4.63 pre-educational program implementation and improved to 20.81±5.58 post educational program application. Additionally, there was a statistically significant distinction among pre and post educational program employment concerning nurses practice score related to infective endocarditis at P-value= <0.001.

Table (1): Displays a statistically significant association among educational level, previous training on IE care and their total knowledge level pre and post implementing an educational program P-value= 0.042, 0.024 and 0.040, correspondingly.

Table (2): Reveals a statistically significant relationship among years of experience, educational level, previous training on IE care and total practice level pre and post implementing an educational program P-value= 0.037 and 0.045, 0.033, 0.018, 0.027 and 0.005 respectively.

Table (3): Indicates a significant positive correlation among total knowledge and practices pre- educational program (r=0.279 & P=0.024) and post educational program (r=0.379 & P=0.016).

Discussion:

Nurses play a critical role in a multidisciplinary approach to infected endocarditis patients, which focus on patient education, treatment, early recognition, and prevention (Sassen, 2023). So, educational programs are essential for enhancing nursing performance and ensuring the delivery of great-quality patient care, particularly in preventing healthcare-associated infective endocarditis. Consequently, this research implements a targeted educational program constructed to elevate nurses' knowledge and clinical practices to optimize patient outcomes (Rezian et al., 2024).

The current study displayed that a statistically highly significant distinction was noted among pre and post educational program total studied nurses knowledge levels. This finding is supported by Markowski, (2021) and Dylan et al (2021) who both presented that there was statistically greatly notable among nurses' knowledge after the employment of educational program. On the other hand, this result was disagreed with Chi et al., (2022) in their study that whose findings revealed that the level of nurses' knowledge was unsatisfactory.

Overall, these results show that knowledge acquisition is improved by interactive, evidence-based instruction that is customized to clinical needs. Most importantly, this cognitive improvement strengthens patient safety by bridging the knowledge gap between theory and bedside practice.

The current research demonstrated that a statistically significant difference was observed among pre and post educational program implementation regarding mean score of total level of practice. This study was in line with a study by Atia et al., (2022) who observed a statistically notable distinction in the total nurses score of practice before and after educational program implementation.

From the researcher's perspective, this significant improvement demonstrates that structured educational program implementation is highly operative in increasing clinical practices that were previously focused on routine or traditional rather than evidence-based principles.

The outcomes of this research revealed that a statistically significant association among nurses' educational level, previous training on IE care and their total knowledge level before and after educational program. This finding is in line with Ibrahim et al. (2026), who revealed that there was a statistically significant relationship among nurses' knowledge level, educational level and training courses.

From the researcher's perspective, these relationships suggest that the positive influence of previous training highlights the role of prior exposure in facilitating knowledge acquisition during the program, emphasizing that continuous professional development is essential to maintain clinical competence.

The present study revealed statistically significant relationship among nurses' total practice and several variables, including their years of experience, educational level and previous training on IE care before and after educational program. This finding aligns with Ibrahim M. et al. (2025), who documented a statistically significant association among nurses' practice levels, years of experience and preceding training before and after educational program.

The present research showed a statistically significant positive correlation among total nurses' knowledge and practice. This finding aligns with Mahrous et al. (2024) & Zhang et al. (2025) who both revealed a significant positive association among nurses' knowledge and practice.

From the researcher's perspective, these interrelationships signify that the theoretical knowledge acquired by studied nurses effectively translates into clinical practical, enabling them to safely execute practical skills once a clear, scientific understanding of infective endocarditis is established

Study limitations:

The primary limitation is the small sample size (N=40) obtained by convenience sampling. However, this number represents the total available population of nurses in the cardiac department during the study period, which limits the generalizability of the findings to large clinical settings.

Conclusion:

According to the findings of this study, it can be inferred that the implemented educational program was effective in enhancing nurses-performance in the care of high-risk patients with infective endocarditis. The study findings revealed statistically significant increases in nurses' knowledge and practices following the implementation of the educational program, which supports the achievement of the study aim

Recommendations:

- Provide regular educational programs for nurses to increase their knowledge and skills in caring for high-risk patients having infective endocarditis.
- Apply evidence-based nursing guidelines to ensure safe and effective care for patients at risk of infective endocarditis.
- Conduct continuous education and refresher courses to maintain nurses' competence.

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