

# Myocardial Protection During Cardiac Surgery; Knowledge and Practices

Khalid Mahmood Sabri, MSc.N\* Hakemia Shakir Hassan, Ph.D\*\*

## ABSTRACT

**Objective:** The aim of the study is to evaluate the Knowledge and practices program toward myocardial protection during cardiopulmonary bypass.

**Material:** A pre-experimental design (one group pretest- posttest design) was used to carry out this study in three governmental hospitals in Baghdad ( Iraqi Centre for Heart Diseases , Ibn – Albitar Centre for Cardiac Surgery and Ibn – Alnafees Centre for Cardiothoracic and Vascular Surgery ) for the period from 15<sup>th</sup> of January 2022 into 20<sup>th</sup> of March 2023. The construction and development of the program and instruments had carry out by the researcher to measure the purposes of the study , twenty two nurses was purposively assigned for the study group . The study instrument consisted from three parts, socio – demographic data that consist from (4) items, knowledge part that consist from (9) items , and observational checklist for practices part that consist from (4) items . Descriptive and inferential statistics was used to analyze the study data.

**Results:** The results of the study presented that highly significant level between pretest and posttest related to knowledge and practices program toward myocardial protection during cardiopulmonary bypass

**Conclusion:** Perfusionist knowledge and practices toward myocardial protection had been improved after applying the program.

**Key words:** DelNido cardioplegia, Myocardial protection, Cardiac surgery.

## INTRODUCTION

For the last several decades, myocardial protection has been essential in performing cardiac surgery to protect the myocardium from ischemia/reperfusion-induced damage during the operation, which has been attributed to clinical and experimental research activity in order to achieve better results in various cardiac operations under cardiac arrest. According to James et al.,(2020), there are numerous methods of myocardial protection during cardiac surgery, including crystalloid or blood cardioplegia, temperature modulation (cold, tepid, or warm), cardioplegia delivery direction (antegrade or retrograde), single-dose or multi-dose infusion, intermittent or continuous infusion, cold or warm induction, controlled reperfusion, pharmacological pretreatment or additives to cardioplegia, and pre-and post-condition<sup>1</sup>. Cardiac surgery is used to treat many cardiac complications that cannot be treated medically; it is one of the most common treatments of coronary artery diseases when angioplasty is ineffective, and it is known as Coronary Artery Bypass Grafting (CABG)<sup>2,3</sup>. The possibility of performing advanced cardiac surgery was established when cardiopulmonary bypass was introduced, which can facilitate surgeries of the heart and great vessels<sup>4</sup>. According to the American Heart Association (AHA,2022), coronary artery disease is one of the most prevalent cardiovascular diseases and is brought on by the myocardium's insufficient blood supply as a result of cholesterol deposition, which leads to the narrowing or obstruction of the coronary arteries by plaque and, in turn, weakens the heart muscle and a serious condition known as heart failure where the heart is unable to pump blood normally.<sup>5-9</sup>.

## METHOD AND MATERIALS

A Pre-Experimental Design (One Group Pretest-Posttest Design) Was Used To Evaluate The Effectiveness Of Perfusionists Knowledge And

Practices Related To Myocardial Protection During Cardiac Surgery . The Study Has Been Carried Out During The Period From 15<sup>th</sup> Of January 2022 Into 20<sup>th</sup> Of March 2023 In Three Governmental Hospitals In Baghdad (Iraqi Centre For Heart Diseases, Ibn – Albitar Centre For Cardiac Surgery And Ibn – Alnafees Centre For Cardiothoracic And Vascular Surgery). After Ethical Approval Getted From College Of Nursing In University Of Baghdad, Ministry Of Health Agreed Of Ethical Consideration For The Research, Each Participant In The Study Signed An Agreement To Participated In The Study. Related To The Sampling Of The Study Purposively Selected (29) Of Perfusionist That Work In Cardiopulmonary Bypass Unite At Cardiac Surgery Department, Seven Of The Participant In The Study Was Excluded From The Study Sample (Six Of Them Participated In Pilot Study And One Is Getted More Than 60 % In Pre-Test). The Program Was Designed And Constructed Based On The Results Of Need Assessment Of Perfusionists Knowledge And Practices Toward Myocardial Protection During Cardiopulmonary Bypass In Cardiac Operative Rooms At Baghdad Governments Cardiac Teaching Hospitals And Through A Review Of American Society For Extra Corporeal Technology ( Amsect ) For Practice Part Of The Program And European Board Of Clinical Perfusion ( Ebcpc ) Guidelines , Literature, And Previous Studies That Concerning With Cardioplegia And Myocardial Protection .The Revision Was Made On The Program Contents Based On These Experts' Recommendations And Suggestions. The Experts Have Agreed That The Program Able To Improve The Perfusionists Knowledge And Practices Toward Myocardial Protection During Cardiac Surgery. To Achieved And Measured The Objectives Of The Study The Researcher Has Constructed The Study Instruments Based On The Review Of The Relevant Literature And Previous Study. The Study Instrument Consists Of Three Parts Include Part I: Socio-

\* College of Nursing, University of Baghdad  
Iraq.  
E-mail: khalidmahmoodsabri82@gmail.com

\*\* College of Nursing, University of Baghdad  
Iraq.  
E-mail :dr.hakemia@conursing.uobaghdad.edu.iq

Demographic Data Form Consisted From (Age, Gender, Level Of Education And Years Of Experiences). Part Ii: Perfusionist Knowledge Toward Myocardial Protection Which Include (9) Items And For The Practice Part Checklist Has Been Used Which Consisted From (4) Items Related To Myocardial Protection During Cardiopulmonary Bypass. Intra - Rater Reliability Used To Measure Reliability Of The Study With Spss Applications And It Was (0.875) Which Is Acceptable

That Indicate The Data Collected Throw This Instrument Are Reliable. Data Collected In The Period Of Five Month From 11th Of Jun 2022 Into 6th Of November In Two Points, Pretest And After The Applying Of The Program In (4) Weeks The Posttest Had Been Conducted. By Using Spss Statistical Analysis Program Version 22, Inferential And Descriptive Analysis Method Had Been Used To Analyze The Data Of Presented Study.

## RESULTS

**Table 1:** Distribution of the Participants According to their Socio Demographic Data Characteristics

Demographic Characteristics	Subgroup	f.	%
Age group	20-26 years	1	4.5
	27-32 years	3	13.6
	33-38 years	14	63.6
	39-44 years	2	9.1
	45-50 years	2	9.1
	total	22	100%
Gender	Male	8	36.4
	Female	14	63.6
Years of experience	1-5 years	9	40.9
	6-10	8	36.4
	11-15	3	13.6
	16 years and above	2	9.1
Education level	Diploma	0	0
	Bachelor	19	86.4
	Master	3	13.6
	PhD	0	0

**Table 2:** Comparative Data Between Pretest and Posttest Related to Perfusionist Knowledge Toward Myocardial Protection

knowledge related to Myocardial Protection	Pre- test			Post- test			t- test analysis		
	Mean	SD	Eva.	Mean	SD	Eva.	t- test	df	p. value
1. The general concept of cardioplegia is:	0.59	0.503	M	0.91	0.294	G	2.309-	21	0.031
2. For adult cases which type of cardioplegia preferred to be use:	0.09	0.294	P	0.86	0.351	G	8.450-	21	0.000
3. For pediatric cases which type of cardioplegia preferred to be use:	0.18	0.395	P	0.86	0.351	G	6.708-	21	0.000
4. The duration time of protection with St. Thomas myotherm is:	0.59	0.503	M	0.86	0.351	G	2.027-	21	0.056
5. The duration time of protection with plazmalyt base Del Nido is:	0.59	0.503	M	0.91	0.294	G	3.130-	21	0.005
6. The proper dose of cardioplegia for adult is:	0.59	0.503	M	0.91	0.294	G	2.628-	21	0.016
7. The proper dose of cardioplegia for pediatric is:	0.41	0.503	MI	0.86	0.351	G	3.578-	21	0.002
8. Good myocardial protection depend on:	0.50	0.512	M	0.82	0.395	G	1.914-	21	0.069
9. Maximum protection of the heart will be achieved by using:	0.41	0.503	MI	0.86	0.351	G	2.887-	21	0.009
<b>Overall</b>	<b>0.43</b>	<b>0.295</b>	<b>MI</b>	<b>0.87</b>	<b>0.098</b>	<b>G</b>	<b>6.525-</b>	<b>21</b>	<b>0.000</b>

M = Mean of score, S.D = Standard Deviation, d.f. = degree freedom, P=probability value, Sig.= Significance, N.S=Non-Significant at p>0.05, S= Significant at p<0.05, H.S: High Significant at p<0.001, Eva.= (P= poor 0-0.25, MI= mild 0.26-0.5, M=moderate 0.51-0.75 and G= good 0.76-1) (Table 2).

**Table 3:** Comparative Between Pretest and Posttest Mean of Knowledge and Practices Related to Myocardial Protection

	Pretest		Posttest		t- test analysis		
	Mean	SD	Mean	SD	t- test	df	p. value
1. Knowledge of Myocardial Protection	0.43	0.295	0.87	0.098	6.525-	21	0.000
2. Practices of Myocardial Protection	1.61	0.406	2.61	0.376	7.541-	21	0.000

Mean of score, S.D = Standard Deviation, d.f. = degree freedom, P=probability value, Sig.= Significance, N. S=Non-Significant at p>0.05, S= Significant at p<0.05, H.S: High Significant at p<0.001 (Table 3).

## DISCUSSION

One of the most important element in cardiac surgery is myocardial protection , in this study we emphasised on the four correct materials , the four (Cs) are : ( **correct dose , correct temperature of cardioplegic solution , correct method and correct time** ) , the concept of cardioplegia doses depend on patient weight that can be categorized into (20 ml/kg) for adult cases and ( 30 ml/kg ) for pediatric cases<sup>10</sup> , temperature of the cardioplegia preferred to be between ( 8-12 ) C<sup>o</sup><sup>11</sup> this can deliver antegradly or retrogradly to the patient . regarding to the time of re-dosing Alex 2021 reported that DNC (DelNido Cardioplegia) should be re dosing every 60-90 minutes to achieved proper myocardial protection with even (1:4) or (4:1) ratio of crystalloid and blood<sup>12</sup>. Results of the study showed in table 1 the most of participants (63.6%) with age group 33-38 years and regarding the gender at most (63.6%) were female. According to the years of experience the high percentage (40.9%) from one to five years. Regarding education level the majority (86.4%) had bachelor's degree. In table 2 and 3 regarding to this program the posttest results show highly significant different than pretest at P. value less than 0.001 with good level of knowledge and practices to the participant compared with pretest.

## CONCLUSION

**The program was very effective in improving perfusionist knowledge towards myocardial protection during cardiopulmonary bypass and the researcher emphasised to use DNC with the four correct (4 Cs) as myocardial protection strategy and use DelNido cardioplegia with 2:2 ratio.**

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**Potential Conflicts of Interest:** None

**Competing Interest:** None

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## References

1. James TM, Nores M, Rousou JA, et al. Warm Blood Cardioplegia for Myocardial Protection: Concepts and Controversies. *Texas Heart Institute J* 2020;47(2):108-16.
2. Abdulrdha M, Mansour K. Nurses' Practices regarding Patients Discharge Planning Post Cardiac Surgery at Cardiac Centers in Baghdad city. *Iraqi National J Nurs Specialties* 2019;31(2):117-28.
3. Sabri K, Hassan H. Effects of Hypothermia on Renal Functions for Patients undergo Coronary Artery Bypass Graft Surgery. *Iraqi National J Nurs Specialties* 2018; 2(25):51-61.
4. Sarkar M, Prabhu V. Basics of cardiopulmonary bypass. *Indian J Anaes* 2017;61(9):760-7.
5. American Heart Association. Multiple pages. What is cardio vascular disease coronary artery disease. 2022; <https://www.heart.org/en/health-topics/consumer-healthcare>.
6. Aljanabi M , Hassan H. Effectiveness of Nursing Intervention on Physiological Status for Patients Undergoing Coronary Catheterization. *Kufa J Nur Sci* 2022;10(1):1-11.
7. Mohammed A K , Nadr J H. Early complications associated with obesity following coronary artery bypass graft surgery: Obesity and post-CABG morbidity. *J Faculty of Medicine Baghdad* 2022;63(4):158-62.
8. Obaid H, Mohammed S. Effectiveness of Educational Program on Nurses Knowledge Toward Nursing Management for Patients Undergoing Percutaneous Coronary Intervention in Cardiac Centre at Al-Dewaniyah City. *Iraqi National J Nurs Specialties* 2020;33(1):12-20.
9. Mousa A M, Mansour K. Effectiveness of an Instructional Program Concerning Healthy Lifestyle on Patients' Attitudes after Percutaneous Coronary Intervention at Cardiac Centers in Baghdad City. *Iraqi National J Nurs Specialties* 2020;33(1):1-11.
10. Panigrahi, D, Roychowdhury S, Guhabiswas R, et al. Myocardial protection following del Nido cardioplegia in pediatric cardiac surgery. *Asian Cardiovasc Thorac Ann* 2018 ;26(4):267-72.
11. Matte GS, Del Nido PJ. History and use of del Nido cardioplegia solution at Boston Children's Hospital. *J Extra Corpor Technol* 2012;44(3):98-103.
12. D'Angelo AM, Nemeth S, Wang C, et al. Re-dosing of del Nido cardioplegia in adult cardiac surgery requiring prolonged aortic cross-clamp. *Interact Cardiovasc Thorac Surg* 20221;34(4):556-63.