

A STUDY TO ASSESS THE EFFECTIVENESS OF ICE PACK APPLICATION ON PAIN AND PHYSIOLOGICAL PARAMETERS DURING REMOVAL OF INVASIVE LINES IN A TERTIARY CARE CARDIAC CENTRE, NEW DELHI

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ABSTRACT

Nowadays many efforts are being done to decreasing cardiovascular diseases which is expeditiously increasing owing to physiological constraints and unhealthy lifestyle. Many patients undergo cardiothoracic surgery, following a cardiothoracic surgery invasive lines are inserted which gives worst experience of pain during removal. The need for pain relief is an important concern today in the society. Hence it is better to add up a non-pharmacological therapy along with medical treatment to maximize the pain control. Ice pack application has a significant short term analgesic effect on pain and physiological parameters of reducing the painful nerve conductions by acting on the gate control system. The non-pharmacological therapies always have its own merits with less side effects which the nurses by their standing orders can implement to the post- surgical patients to lesion the severity of pain.

KEYWORDS: Ice pack application, pain, physiological parameters, invasive lines.

INTRODUCTION

Our societies are confronting profound challenges globally due to the high rise of cardiovascular diseases (CVDs). Meeting these challenges require assessment of how overall worldwide health trends affect. According to a Global Burden of Disease (GBD) 2015, 422.7 million cases are estimated of CVDs. It remains a major cause of health loss for all regions of the world. CVDs directly demand attention and surgical intervention for improving the quality of life.^[1]

In the last 50 years cardiac surgeries, globally whether through cardiovascular diseases, congenital defects, rheumatic heart disease or generalized degradation of craniological function. In India 50,000- 60,000 cardio thoracic operations are performed every year, from 2006 - 2016 isolated surgical AVR were performed 61.2%, AVR with coronary artery bypass grafting (CABG) in 23.9%, AVR with mitral valve replacement (MVR) in 7%, and transcatheter aortic valve implantation (TAVI) in 2.3% of patients.^[2]

During surgical intervention invasive lines are placed for multiple reasons. For giving IV fluids, medication, haemodynamic monitoring and determine if a patient is

dehydrated or has received an adequate amount of fluid to support bodily functions. The presence of invasive lines is associated with considerable discomfort in the conscious mind.^[3]

The placement of invasive lines is a common experience of pain in thousands of patients. It is unpleasant feeling for patient which increase anxiety and trigger an autonomic response. The long term presence of invasive lines causes pain, infection and infiltration which increased length of hospital stay, and economical liability. Although analgesics drugs are the most effective measures to nurses but it have some side effect. Side by side the non-pharmacological measures like ice pack, massage, relaxation technique are great source to relief from pain.^[4]

Cold application is an effective technique for pain relief. This technique reduces the speed of nervous conductance and pain. Similarly, based on the gate control theory of pain, stimulation of thick fibres through methods such as cooling may close the gate and reduce pain. Cold application can be used to reduce or reverse pain impulses via activating descending inhibitory neurons,

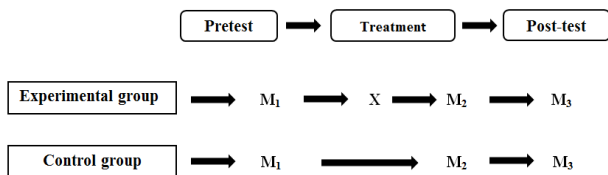
which block ascending nociceptive nerves originating from the substantial gelatinosa.^[5]

MATERIAL AND METHODS

Research Design

The research design selected for the study was Quasi-experimental pre-test post-test control group research design which was considered appropriate for the present study to assess the effectiveness of ice pack application on pain and physiological parameters during removal of invasive lines.

The diagrammatic representation of research design is-



The diagrammatic representation of research design Where

M= Measurement

X= Treatment (Ice pack application 10 min. prior to invasive line removal.

M₁= Measurement of pain, HR, RR, BP taken before the treatment.

M₂= Measurement of pain, HR, RR, BP taken at zero minute after the treatment.

M₃= Measurement of pain, HR, RR, BP taken at Fifteen minute after the treatment

Experimental group: - ice pack application given to the patient for 10 min.

Control group: -control group taking routine care

Statement of problem

A study to assess the effectiveness of ice pack application on pain and physiological parameters during removal of invasive lines in a tertiary care cardiac centre, New Delhi.

Aim of the Study

To assess the effectiveness of ice pack application on pain and physiological parameters during removal of invasive lines.

Research Question

How much effective is ice pack application on pain and physiological parameters changes during removal of invasive lines?

Objectives of study

1. To identify the effect of ice pack application on pain amongst post-surgical patients during invasive line removal.
2. To identify the effect of ice pack on physiological parameters (Blood pressure, respiration rate, and Heart rate).

3. To find out association between pain scores and selected demographic variables.

Operational Definitions

- **ASSESS**-It is a statistical measurement of the effectiveness of ice pack application on pain by assessing visual analogue pain intensity scale in pre and post intervention.
- **EFFECTIVENESS**- In this study it refers to the degree to which objectives are achieved or the ability to produce intended result.
- **ICE PACK APPLICATION**-It refers to wrapping of ice pack in a clean towel and placing it around the invasive lines site for 10 minutes prior to removal of invasive line.
- **PAIN**- It refers to the intensity of pain experienced by the patient during invasive lines removal which was assessed subjectively and objectively using visual analogue pain intensity scale within 15 minutes of the invasive lines removal.
- **PHYSIOLOGICAL PARAMETERS**- Human health state is defined as variety of physiological parameters for understanding of normal body function. Heart rate, respiration rate and blood pressure are the main parameters which come under this study.
- **HEART RATE**- The number of heartbeats per unit of time, usually per minute. The heart rate is based on the number of contractions of the ventricles. It will be measured via the cardiac monitor.
- **RESPIRATION RATE**-The number of breaths per minute or, more formally, the number of movements indicative of inspiration and expiration per unit time. It is usually determined by counting the number of times the chest rises or falls per minute, it will be measured manually.
- **BLOOD PRESSURE**- Blood pressure is the force of the blood pushing against the artery walls during contraction and relaxation of the heart, measured using sphygmomanometer.
- **INVASIVE LINE**- Invasive line is the thin tube which is inserted in to the body for therapeutic or diagnostic purposes. In this study it includes chest tube, central line, pacing wire and arterial line.
- **CHEST TUBE**-A chest tube is a hollow, flexible tube placed into the chest. It drain blood, fluid, or air around lungs, heart, or oesophagus.
- **CENTRAL LINE**-An IV line that is inserted into a large vein (Internal jugular vein and subclavian vein) typically in the neck or near the heart for therapeutic or diagnostic purposes to administer medicines or fluids or withdraw blood.
- **PACING WIRE**- Pacing wire is an intervention that helps the heartbeat get back to a normal pace if it has been temporarily out of rhythm. Wires are inserted through the chest (during heart surgery) and are directly connected to the heart which delivers a current to the heart to make it beat normally.

- **ARTERIAL LINE**-An arterial line is a thin catheter inserted into an artery. It is most commonly used to monitor blood pressure directly and in real-time (rather than by intermittent and indirect measurement) and to obtain samples for arterial blood gas analysis.

Variable under study

Independent Variable: - Ice pack application

Dependent Variable: - pain, heart rate, respiration rate and blood pressure.

Extraneous Variable: -Demographical variables like age, gender, education, employment status, type of work, habits.

Assumption

The Study is based on the assumption that

1. Majority of the patient during invasive line removal experience pain.
2. Ice pack application is a method to close the gate hence helps alleviating pain as per gate control theory (GCT).
3. Physiological parameters fluctuation in post-surgical cardiac patients will cause complication and become lethal.

Conceptual framework

The conceptual framework for the study was based on Wiedenbachs Helping Art of Clinical Nursing Theory.

Setting

The study is conducted at National Heart Institute, East of Kailash, New Delhi. It is a 104 bedded super-specialty hospital having eight bedded post recovery unit and equipped with 2 cardiac operation theatre offering cardiac surgeries including CABG. In tertiary cardiac care hospital average 30 cardiac surgeries carried out per month.

Sample and Sampling Technique

Population

Population for the present study was post- surgical cardiac patients who were admitted in National Heart Institute, New Delhi.

Sample

The sample of the study was post- surgical cardiac patients who were having four invasive lines (Chest tube, Arterial line, Pacing wire and central line) admitted in National Heart Institute, New Delhi.

Sampling technique

The purposive sampling technique was used for the present study.

Inclusion criteria

Sample were collected from patient who were

1. Patients above 20-yearsto be part of study.
2. Fully conscious, ability to understand numerical pain intensity scale.

3. Body mass index of < 30 kg/m².
4. Hemodynamically stable

Exclusion criteria

The patient who were

1. Oversensitivity to cold.
2. Visual or auditory defects.
3. Inability to verbally report pain.
4. Received analgesic less than 4 hours before intervention and drug dependency

Sampling size

Sampling size for the present study was 60 (30 experimental group), (30 control group) post- surgical cardiac patient who were admitted in post- surgical cardiac unit of National Heart Institute, New Delhi.

Ethical consideration

1. Formal scientific advisory, research and ethical committee clearance certificate was Ethics Committee of All India Heart Foundation (AIHF) of East ok Kailash, New Delhi.
2. Formal permission was obtained from CEO of National Heart Institute to conduct research study on the post- surgical cardiac patients of the hospital.
3. Post- surgical cardiac patients were informed that participation in the study was voluntary and were guaranteed that data would be treated anonymously. The confidentiality of data was maintained.
4. Written informed consent was obtained from each patient for being part of the study.

Data collection tools and technique

In the present study, based on the objectives the tools were divided into 2 sections:-

Section I- A Semi structured interview schedule was prepared to collect the sample characteristic. The characteristics include patient's age, gender, educational status, occupation, type of work, personal habits, any previous surgery, number of invasive lines, and duration of removal of invasive lines.

Section II – It includes pain medications received within past four hours, and assessment of physiological parameters involving pain, respiration rate, heart rate and blood pressure assessed in three intervals, before removal of invasive line as well as at zero minute of removal of invasive line and after 15 minutes of removal of invasive lines by visual analogue pain intensity scale.

Validity of the tools

The validity of the tool was obtained by submitting the tools to 6 experts and it was valid. All the rectification was as suggested by the experts.

Reliability of the tools

The Test–retest reliability method was used to test the reliability of tool and reliability was found 0.828 of pain, 0.771 of respiratory rate, 0.988 of heart rate, 0.887 of systolic blood pressure, and 0.828 of diastolic blood pressure.

Procedure for final data collection

Formal permission was obtained from the concerned authorities to conduct the final study by using purposive sampling technique according to research design.

The data was collected between the periods of three months. The demographic Performa was given to the patient who undergone cardiac surgery and having four invasive lines. Pain medications which was received within past four hours was checked. Then baseline data of respiration rate is checked manually, heart rate was checked through a cardiac monitor and blood pressure was checked using a sphygmomanometer before removal of invasive lines. Then intervention of ice pack application was given to experimental group for 10 minutes, as well as the control group taking routine care. Then again physiological parameters (HR, BP, R. R) was assessed at zero minutes of removal of invasive lines and after 15 minutes of removal of invasive lines. Pain was assessed using visual analogue pain intensity scale. On

an average it took 45 minutes to collect data from each patients.

RESULT AND DISCUSSION**Section 1: - Description of demographic variables in post-surgical cardiac patient.**

This section described demographic variables of post-surgical cardiac patients. A total of 60 subjects were selected for the study. There were total two groups and each group contained 30 subjects. This section contain demographic characteristics of the sample such as age, gender, education, occupation, type of work, personal habits, operative procedure number of invasive lines, previous surgeries, time of removal of all invasive lines. The data was gathered from post -operative cardiac patients and the data collected was tabulated and analysed to obtain frequency and percentage distribution of patients.

Table 1: Frequency and percentage distribution of post-surgical patients according to demographic data (N=60).

Demographic variables	Experimental group		Control group		Total	
	f	%	f	%	f	%
Age(in years)						
20-35	03	10	02	6.7	05	8.3
36-50	02	6.7	20	66.7	22	36.7
51-65	08	26.7	07	23.3	15	25.0
65 and above	17	56.7	01	3.3	18	30.0
Gender						
Male	19	63.3	19	63.3	38	63.3
Female	11	36.7	11	36.7	22	36.7
Education						
Primary	07	23.3	03	10.0	10	16.7
High school	13	43.3	09	30.0	22	36.7
Higher secondary	07	23.3	10	33.3	17	28.3
Graduate & above	03	10.0	08	26.7	11	18.3
Occupation						
Unemployed	08	26.7	07	23.3	15	25.0
Skilled	10	33.3	19	63.3	29	48.3
Unskilled	05	16.7	00	00	05	8.3
Retired	07	23.3	04	13.3	11	18.3
Type of work						
Sedentary work	13	43.3	15	50.0	28	46.7
Moderate work	16	53.3	11	36.7	27	45.0
Heavy work	01	3.3	04	13.3	05	8.3
Personal habits						
Smoking	03	10	04	13.3	07	11.7
Alcoholic	05	16.7	11	36.7	16	26.7
Chewing tobacco	06	20.0	04	13.3	10	16.7
None	16	53.3	11	36.7	27	45.0
Operative procedure						
Coronary Artery Bypass Graft.	22	73.3	20	66.7	42	70.0
Valve replacement surgeries	03	10.0	07	23.3	10	16.7
Device closure	04	13.3	01	3.3	05	8.3
Any other	01	3.3	02	6.7	03	5.0
Any previous surgeries						
Minor	01	3.3	01	3.3	02	3.3

Major	00	00	01	3.3	01	1.7
Nil	29	96.7	28	93.4	57	95.0

In table 1 data reveals that in relation to the age wise distribution of patients, the highest percentage (36.7%) were in the age group of 36-50 years and the lowest percentage (8.3%) were in the age group of 20-35 years.

The gender wise distribution of patients depicts that the highest percentage (63.3%) were of male and (36.7 %) were of female.

The highest percentage (36.7%) of the total sample were educated till high school, (28.3%) completed their higher secondary education, (18.3%) of them were graduate and above and only (16.7%) were educated till primary.

With regards to occupation, out of the total sample (48.3%) were skilled, (25 %) were unemployed, (18.3%) of them were retired and only (8.3%) were unskilled.

Almost (46.7%) were doing sedentary work and (45%) of the sample were doing moderate work and only (8.3%) were doing heavy work.

More than (45%) does not have personal habits and (26.7%) were having habits of alcohol consumption. However (16.7 %) were having habits of chewing tobacco only (11.7%) were having smoking habits.

Majority of the patients (70%) had undergone coronary artery bypass Graft and (16.7%) had undergone valve replacement surgeries. However only (5%) of the sample had undergone any other surgeries.

Majority (95%) of the patient have not undergone any previous surgeries. Out of all the total sample only (3.3%) and (1.7%) had previously undergone minor and major surgeries respectively.

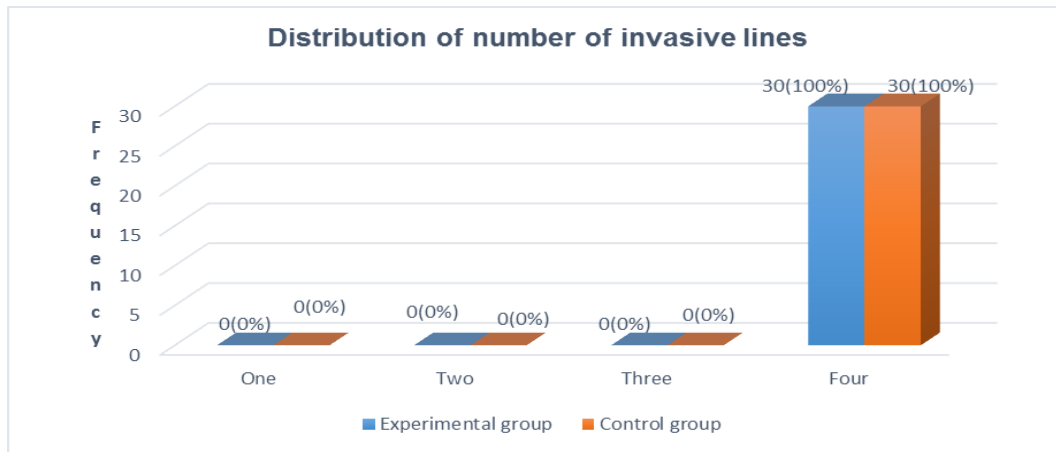


Figure 1: A bar diagram shows the Frequency distribution of post-surgical patients with regards to number of invasive lines (n=30).

In figure 1 data reveals that 100% of the sample have all the four invasive lines.

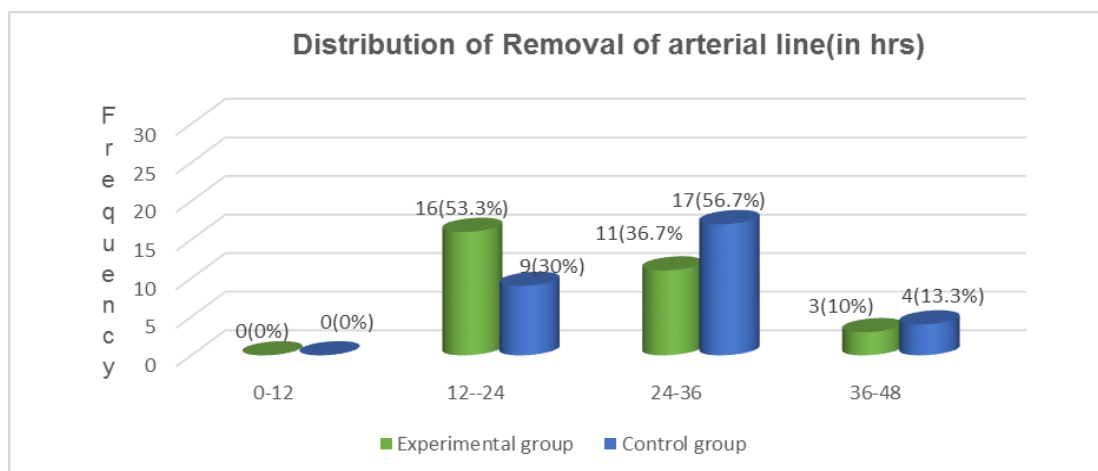


Figure 2: A bar diagram shows the Frequency distribution of post-surgical patients with regards to removal of arterial line (n=30).

Above figure shows that (46.7 %) (41.7%) (11.7%) had their arterial line removal after cardiac surgery within in

24-36 hours, 12- 24 hours and in 36-48 hours respectively.

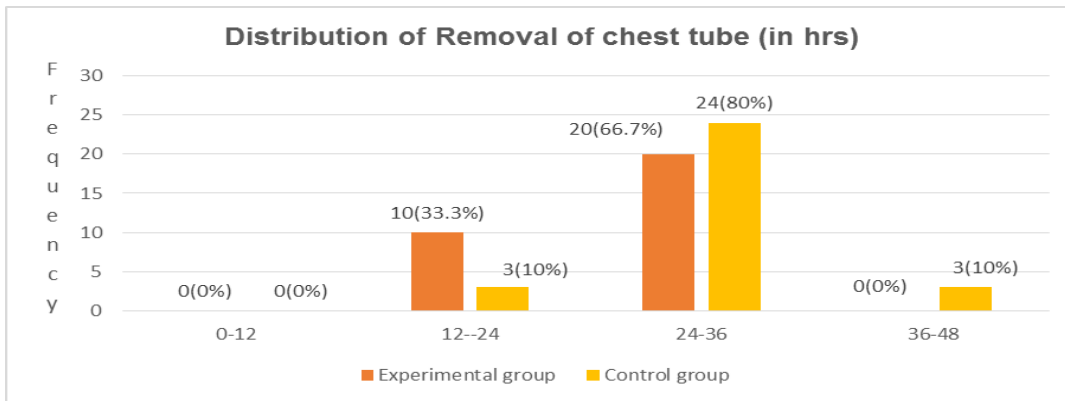


Figure 3: Frequency distribution of post-surgical patients with regards to removal of chest tube (n=30).

Above figure shows that (68.3%) (21.7 %) (5.8%) had their chest tube removal after cardiac surgery within 24-

36 hours, 12- 24 hours and in 36-48 hours respectively.

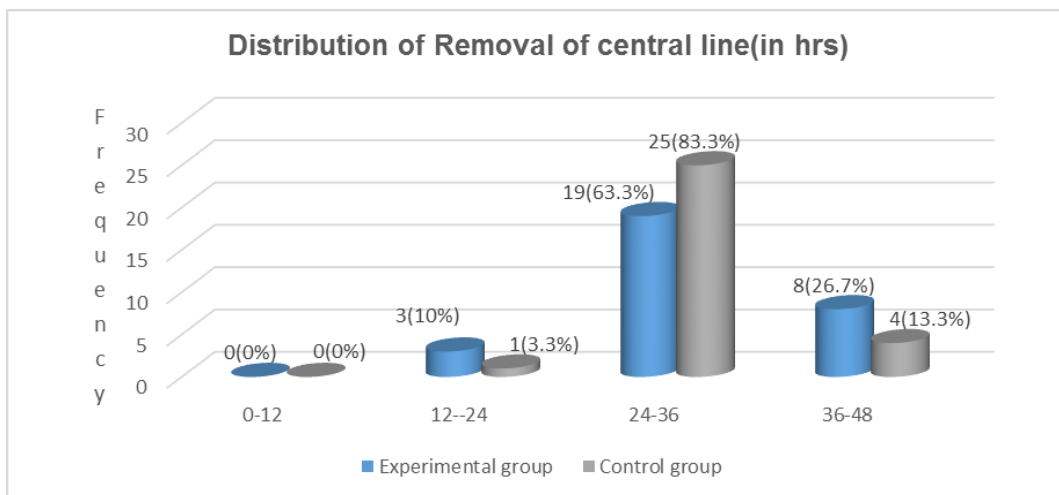


Figure 4: A bar diagram shows the Frequency distribution of post-surgical patients with regards to removal of central line (n=30).

Above figure depict that (73.3%), (20%), (6.7%) had their chest tube removal after cardiac surgery within 24-

36 hours, 36- 48 hours and in 12-24 hours respectively.

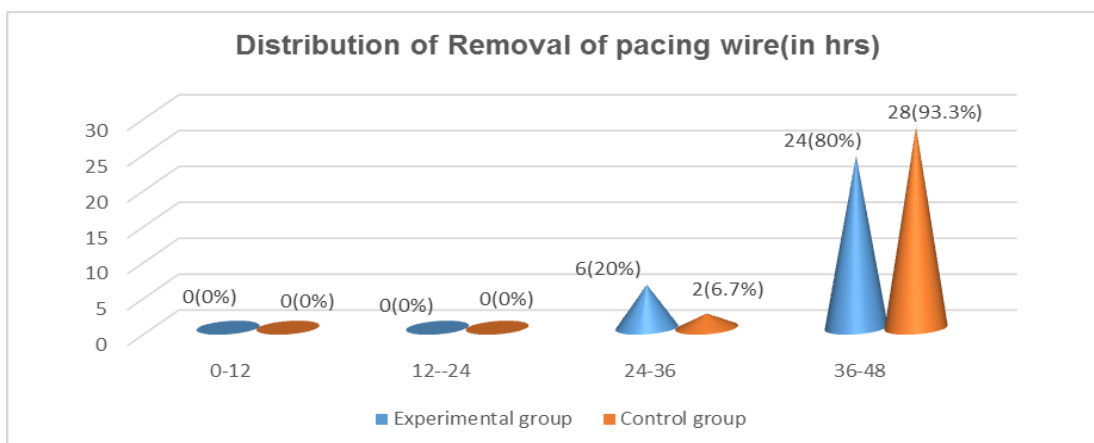


Figure 5: A bar diagram shows the Frequency distribution of post-surgical patients with regards to removal of pacing wire (n=30).

Above figure shows that (86.7%), (13.3%), had their chest tube removal after cardiac surgery within 36-48hours, and in 24-36 hours respectively.

pain medication within past four hours. The data was analysed to obtain frequency and percentage distribution of patient who received pain medication within past four hours.

SECTION 2:- Pain medication received by patient within past four hours

This section described the patient who were received

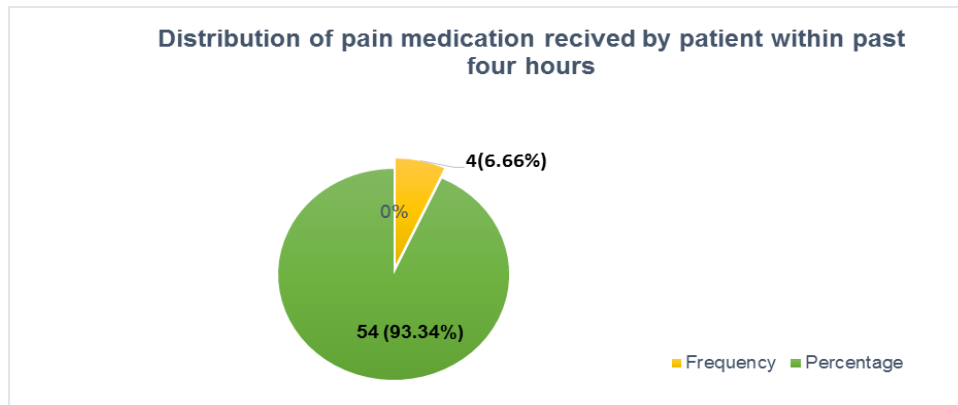


Figure 6: Shows the percentage wise distribution of pain medication received within past four hours (N=60).

The data presented in figure 6 indicated that, Pain medication received within past four hours by patient shows 6.66% before removal of invasive lines. Hence it can be interpreted that 93.34% of the patients have not taken any pain medication within past four hours of removal of invasive line.

surgical cardiac patients. The data was analysed by using mean, standard deviation, unpaired 't' & 'p' test and repeated measure ANOVA test comparing all together within the groups.

SECTION 3:-Effectiveness of ice pack application on pain among post- surgical cardiac patient during invasive line removal.

This section described the effectiveness of ice pack application on pain during invasive line removal in experimental group and control group among post-

Objective-1 To identify the effect of ice pack application on pain among post-surgical patients during invasive line removal.

H₁. There will be significant difference in the mean pre-test and post- test pain scores on ice pack application during removal of invasive lines.

Table 2: Comparison of pre-test and post-test of pain among post- surgical cardiac patients (N=60).

Invasive lines	Group	Comparison	Mean	SD	Unpaired 't' & p value		Repeated measures ANOVA
					Post-test1 EXP-CON	Post-test2 EXP-CON	EXP
Chest tube removal	Exp.	Pre-test	0.133	0.507	9.834 p=0.001*	1.115 p=0.270**	40.067 df=(2,58) p=0.001*
		Post-test 1	1.733	0.981			
		Post-test 2	0.401	0.814			
	Con	Pre-test	0.000	0.000			
		Post-test 1	4.267	1.015			
		Post-test 2	0.2	0.551			
Arterial line removal	Exp.	Pre-test	0.101	0.403	10.999 p=0.001*	0.336 p=0.738**	2.760 df=(2,58) p=0.072**
		Post-test 1	0.367	0.765			
		Post-test 2	0.067	0.365			
	Con	Pre-test	0.2	0.610			
		Post-test 1	3.4	1.302			
		Post-test 2	0.1	0.402			
Pacing wire removal	Exp.	Pre-test	0.000	0.000	11.062 p=0.001*	1,795 p=0.78**	11.528 df=(2,58)
		Post-test 1	0.533	0.861			
		Post-test 2	0.000	0.000			
	Con	Pre-test	0.000	0.000			
		Post-test 1	3.033	0.889			

		Post-test 2	0.2	0.610			p=0.002*
Central line removal	Exp.	Pre-test	0.2	0.610	10.5665	1.828	6.067 df=(2,58)
		Post-test 1	0.767	1.006			
		Post-test 2	0.133	0.507			
	Con	Pre-test	0.2	0.610			
		Post-test 1	3.6	1.069			
		Post-test 2	0.467	0.860			
					p=0.001*	p=0.073**	p=0.04*

Level of significance 0.05; df =58*significant **non-significant

Data in table 2 depict that ice pack application on pain score among post-surgical cardiac patients by using repeated measure ANOVA was found to have significant effects during chest tube removal (p=0.001), pacing wire removal (p=0.002) and central line removal (P=0.04). However ice pack application has no significant effect during arterial line removal (p=0.072) with respect to pain score.

SECTION 4:- Effectiveness of ice pack application on physiological parameters during invasive line removal

This section describes the effectiveness of ice pack application on physiological parameters during invasive

line removal between control group and experimental group. The data was analysed to obtain mean, standard deviation unpaired 't' & p by comparing post-land post-test-2 between experimental and control group. Repeated measures of ANOVA test was compared within the experimental group.

Objective 2: To identify the effect of ice pack on physiological parameters (respiration rate, heart rate and blood pressure) during invasive lines removal.

H₂- There will be significant difference in the mean pre-test and post- test of respiratory rate on ice pack application during removal of invasive lines.

Table 3: Comparison of pre-test and post-test of respiratory rate score among post- surgical cardiac patients (N=60).

Invasive lines	Group	Comparison	Mean	SD	Unpaired 't' & p value		Repeated measures ANOVA
					Post-test1 EXP-CON	Post-test2 EXP-CON	EXP
Chest tube removal	Exp.	Pre-test	19.5	2.129	0.513	0.000	11.677 df=2,58
		Post-test 1	21.2	2.001			
		Post-test 2	20.667	1.647			
	Con.	Pre-test	19.667	1.295			
		Post-test 1	20.967	1.473			
		Post-test 2	20.667	1.348			
Arterial line removal	Exp.	Pre-test	19.467	1.358	2.114	1.095	4.863 df=2,58
		Post-test 1	20.433	1.654			
		Post-test 2	20.301	1.664			
	Con.	Pre-test	19.833	1.858			
		Post-test 1	21.433	1.994			
		Post-test 2	20.833	2.085			
Pacing wire removal	Exp.	Pre-test	19.667	1.647	1.283	3.285	3.227 df=2,58
		Post-test 1	20.433	1.736			
		Post-test 2	19.467	1.383			
	Con.	Pre-test	19.867	1.852			
		Post-test 1	21.033	1.884			
		Post-test 2	20.733	1.596			
Central line removal	Exp.	Pre-test	19.633	1.586	0.693	0.419	1.698 df=2,58
		Post-test 1	22.267	9.577			
		Post-test 2	20.05	1.978			
	Con.	Pre-test	19.6	1.613			
		Post-test 1	21.033	1.829			
		Post-test 2	20.7	1.704			
					p=0.610*	p=1.000**	p=0.001*
					p=0.039*	p=0.278**	p=0.011*
					p=0.205**	p=0.002*	p=0.047*
					p=0.491**	p=0.676**	p=0.676**

Level of significance 0.05; df= 58 *significant **non-significant

Data in table 3 shows that ice pack application on respiratory rate among post- surgical cardiac patient have significant effects during chest tube removal (p=0.001),

arterial line removal (p=0.011), and pacing wire removal (p=0.047). Whereas it was found to be insignificant during central line removal ((p=0.676).

Table 4: Comparison of pre-test and post-test of heart rate score among post- surgical cardiac patients (N=60).

Invasive lines	Group	Comparison	Mean	SD	Unpaired 't' & p value		Repeated measures ANOVA
					Post-test1 EXP-CON	Post-test2 EXP-CON	EXP
Chest tube removal	Exp.	Pre-test	89.333	13.649	0.635	0.476	4.120 df=2,58 p=0.021*
		Post-test 1	91.4	13.52			
		Post-test 2	90.267	13.245			
	Con.	Pre-test	91.367	14.089			
		Post-test 1	93.567	12.894			
		Post-test 2	91.9	13.309			
Arterial line removal	Exp.	Pre-test	87.033	10.159	1.909	1.165	1.655 df=2,58 p=0.201**
		Post-test 1	88.433	10.602			
		Post-test 2	88.967	11.242			
	Con.	Pre-test	91.567	12.048			
		Post-test 1	94.0	11.942			
		Post-test 2	92.533	12.442			
Pacing wire removal	Exp.	Pre-test	86.333	10.812	2.054	2.231	1.145 df=2,58 p=0.325**
		Post-test 1	88.367	10.313			
		Post-test 2	87.333	10.895			
	Con.	Pre-test	90.4	9.298			
		Post-test 1	93.633	9.536			
		Post-test 2	93.067	8.913			
Central line removal	Exp.	Pre-test	84.867	9.511	3.078	2.919	7.437 df=2,58 p=0.001*
		Post-test 1	87.000	9.906			
		Post-test 2	86.6	9.765			
	Con.	Pre-test	92.633	9.182			
		Post-test 1	94.533	9.031			
		Post-test 2	94.067	10.048			

Level of significance 0.05; df= 58 *significant **non-significant

The data presented in table 4 shows that ice pack application on heart rate among post –surgical cardiac patient have significant effects during chest tube removal

(p=0.001) and arterial line removal (p=0.011). Whereas it was found to be insignificant during arterial line removal (p=0.201) and pacing wire removal (p=0.325).

Table 5: Comparison of post-test 1 and post-test 2 of systolic blood pressure score among post- surgical cardiac patients (N=60).

Invasive Lines	Group	Comparison	Mean	SD	Unpaired 't' & p value		Repeated measures ANOVA
					Post-test1 EXP-CON	Post-test2 EXP-CON	EXP
Chest tube removal	Exp.	Pre-test	111.211	14.079	1.572	0.962	0.646 df=2,58 p=0.528**
		Post-test 1	111.231	14.014			
		Post-test 2	112.323	15.16			
	Con.	Pre-test	114.831	14.156			
		Post-test 1	116.623	13.751			
		Post-test 2	115.971	13.773			
Arterial line removal	Exp.	Pre-test	111.772	11.318	1.455	1.846	0.434 df=2,58 p=0.650**
		Post-test 1	112.934	12.224			
		Post-test 2	112.672	10.026			
	Con.	Pre-test	116.501	11.688			
		Post-test 1	117.632	12.791			
		Post-test 2	117.772	11.331			

Pacing wire removal	Exp.	Pre-test	109.213	9.402	1.717	3.053	6.214
		Post-test 1	112.302	7.865			
		Post-test 2	110.435	8.904			
	Con.	Pre-test	114.701	10.554			
		Post-test 1	116.732	11.75			
		Post-test 2	117.802	9.845			
Central line removal	Exp.	Pre-test	112.638	8.799	1.765	1.461	0.325
		Post-test 1	113.421	9.538			
		Post-test 2	13.821	9.026			
	Con.	Pre-test	117.421	10.407			
		Post-test 1	117.834	11.573			
		Post-test 2	117.401	10.036			

Level of significance 0.05; df= 58 *significant **non-significant

In table 5 the above data depict that ice pack application on systolic blood pressure among post –surgical cardiac patient have significant effects during pacing wire removal (p=0.04).Whereas it was found to be

insignificant effects during chest tube removal, arterial line removal, and central line removal (p=0.528), (p=0.650), (p=0.724) respectively.

Table 6: Comparison of post-test 1 and post-test 2 of diastolic blood pressure score among post- surgical cardiac patients (N=60).

Invasive lines	Group	Comparison	Mean	SD	Unpaired 't' & p value		Repeated measures ANOVA
					Post-test1 EXP-CON	Post-test2 EXP-CON	EXP
Chest tube removal	Exp.	Pre-test	64.267	8.959	0.778	1.179	2.663
		Post-test 1	66.23	7.916			
		Post-test 2	66.66	7.985			
	Con.	Pre-test	65.267	7.899			
		Post-test 1	67.967	9.290			
		Post-test 2	68.900	7.097			
Arterial line removal	Exp.	Pre-test	66.767	7.118	0.808	2.165	2.344
		Post-test 1	66.267	8.855			
		Post-test 2	66.301	7.773			
	Con.	Pre-test	68.167	7.096			
		Post-test 1	68.133	9.031			
		Post-test 2	70.533	7.366			
Pacing wire removal	Exp.	Pre-test	67.179	6.561	2.203	3.040	0.0228
		Post-test 1	66.201	8.619			
		Post-test 2	66.067	6.158			
	Con.	Pre-test	69.6	7.6			
		Post-test 1	70.8	7.513			
		Post-test 2	71.133	7.741			
Central line removal	Exp.	Pre-test	66.3	5.44	2.093	1.263	2.402
		Post-test 1	65.9	5.695			
		Post-test 2	68.167	6.497			
	Con.	Pre-test	70.0	6.868			
		Post-test 1	69.6	7.833			
		Post-test 2	70.267	6.384			

Level of significance 0.05; df =58 *significant **non-significant

In table 6 the data represent that ice pack application on diastolic blood pressure among post –surgical cardiac patient have insignificant effects during chest tube removal (p=0.078), arterial line removal(p=0.912), pacing wire removal(p=0.797) and central line removal (p=0.099). Hence it is interpreted that the patient have

slight changes on diastolic blood pressure after ice pack application.

SECTION 5:- Association between pain scores and selected demographic variables

This section describes the association between post- test pain score during chest tube removal with selected

demographic variables of post- surgical cardiac patients of experimental group and control group. The data was analysed to obtain chi square and p value.

H₅- There will be significant association between post-test pain scores and selected demographic variables.

Objective: To find out association between pain scores and selected demographic variables.

Table 7: Association between post-test pain scores during chest tube removal with selected demographic variables of post- surgical cardiac patients in experimental group (n=30).

Sl. No	Demographic variables	f	Level of pain		Chi square	df	Table value	P value
			No pain	Mild pain				
1	Age(in years)				2.472	3	7.815	0.480**
	20-35	03	03	00				
	36-50	02	02	00				
	51-65	08	07	01				
	65 and above	17	12	05				
2	Gender				2.907	1	3.841	0.088**
	Male	19	17	02				
	Female	11	07	04				
3	Education				1.291	3	7.815	0.731**
	Primary	07	05	02				
	High school	13	10	03				
	Higher secondary	07	06	01				
	Graduate & above	03	03	00				
4	Occupation				1.696	3	7.815	0.638**
	Unemployed	08	06	02				
	Skilled	10	08	02				
	Unskilled	05	05	00				
	Retired	07	05	02				
5	Type of work				0.343	2	5.991	0.843**
	Secondary work	13	10	03				
	Moderate work	16	13	03				
	Heavy work	01	01	00				
6	Personal habits				6.562	3	7.815	0.087**
	Smoking	03	03	00				
	Alcoholic	05	05	00				
	Chewing tobacco	06	06	00				
	None	16	10	06				
7	Operative procedure				2.727	3	7.815	0.436**
	Coronary Artery Bypass Graft.	22	16	06				
	Valve replacement surgeries	03	03	00				
	Device closure	04	04	00				
	Any other	01	01	00				
8	Any previous surgeries				0.259	1	3.841	0.611**
	Minor	01	01	00				
	Nil	29	23	06				
9	Number of Invasive lines				No cross table			
	Four	30	24	06				
10	Removal of Arterial line (in hrs.)				1.129	2	5.991	0.569**
	12- 24	16	13	03				
	24-36	11	08	03				
	36-48	03	03	00				
11	Removal of chest tube (in hrs.)				0.000	1	3.841	1.000**
	12- 24	10	08	02				
	24-36	20	16	04				

12	Removal of central line (in hrs.)				1.505	2	5.991	0.471**
	12- 24	03	03	00				
	24-36	19	14	05				
	36-48	08	07	01				
13	Removal of pacing wire (in hrs.)				0.052	1	3.841	0.819**
	24-36	06	05	01				
	36-48	24	19	05				

Level of significance 0.05 ** non significant

In table 8 Chi-square values was calculated to find out the association between the post-test pain score during chest tube removal in experimental group with their selected demographic variables which reveals that there is no significant association between post-test pain score during chest tube removal with age, gender, educational

status, occupation, type of work, personal habits, operative procedure, previous surgery, number of invasive line and removal of all invasive lines. Hence, it can be interpreted that there is no association of post- test pain score of chest tube removal with demographic variables in the experimental group.

Table 9: Association between post-test pain scores of chest tube removal and selected demographic variables of post- surgical cardiac patients in control group (n=30).

Sl. No	Demographic variables	f	Level of pain		Chi square	df	Table value	P value
			No pain	Mild pain				
1	Age(in years)				1.104	3	7.815	0.776**
	20-35	02	02	00				
	36-50	20	16	04				
	51-65	07	7	00				
	65 and above	01	1	00				
2	Gender				3.997	1	3.841	0.136**
	Male	19	18	01				
	Female	11	08	03				
3	Education				10.333	3	7.815	0.111**
	Primary	03	01	02				
	High school	09	08	01				
	Higher secondary	10	09	01				
	Graduate & above	08	08	00				
4	Occupation				2.152	2	5.991	0.708**
	Unemployed	07	05	02				
	Skilled	19	17	02				
	Retired	04	04	00				
5	Type of work				0.839	2	5.991	0.933**
	Secondary work	15	13	02				
	Moderate work	11	09	02				
	Heavy work	04	04	00				
6	Personal habits				6.989	3	7.815	0.072**
	Smoking	04	02	02				
	Alcoholic	11	11	00				
	Chewing tobacco	04	03	01				
	None	11	10	01				
7	Operative procedure				2.679	3	7.815	0.443**
	Coronary Artery Bypass Graft.	20	18	02				
	Valve replacement surgeries	07	06	01				
	Device closure	01	01	00				
	Any other	02	01	01				
8	Any previous surgeries				0.33	2	5.991	0.847**
	Minor	01	01	00				
	Major	01	01	00				
	Nil	28	24	04				

9	Number of Invasive lines Four	30	26	04	No cross tabulation			
10	Removal of Arterial line (in hrs.)				0.928	2	5.991	0.628**
	12- 24	09	08	01				
	24-36	17	14	03				
	36-48	04	04	00				
11	Removal of chest tube (in hrs.)				1.514	2	5.991	0.469**
	12- 24	03	02	01				
	24-36	24	21	03				
	36-48	03	03	00				
12	Removal of central line (in hrs.)				1.175	2	5.991	0.555**
	12- 24	01	01	00				
	24-36	25	21	04				
	36-48	04	04	00				
13	Removal of pacing wire (in hrs.)				0.252	1	3.841	0.615**
	24-36	02	02	00				
	36-48	28	24	04				

Level of significance 0.05,** non- significant

In table 9 Chi-square values was calculated to find out the association between the post- test pain score of chest tube in control group with their selected demographic variables which reveals that there is no significant association between pain scores during chest tube removal with age, gender, educational status, occupation, type of work, personal habits, operative procedure, previous surgery, number of invasive line and removal of all invasive lines. Hence, it can be interpreted that there is no association of pain score during chest tube removal with demographic variables.

DISCUSSION

Cold application is an effective technique for pain relief. This technique reduces the speed of nervous conductance and pain. Similarly, based on the gate control theory of pain, stimulation of thick fibres through methods such as cooling may close the gate and reduce pain.^[5] Ever since pain is the most common complication in post-cardiac surgery patient that cause discomfort. So proper intervention in preventing and reducing the occurrence has become the essential nursing intervention for nurses who are taking care of post-surgical patient.

This study assess the effectiveness of ice pack application on pain and physiological parameters during removal of invasive lines. Total 60 post- surgical cardiac patient were selected and divided in to two equal groups. Experimental group taken ice pack application where the control group taken routine care. The result indicate that there is a significant improvement on pain by ice pack application and this low cost measure are free from any side effect.

Effectiveness of ice pack application on pain

In the present study the effectiveness of ice pack application on pain during chest tube showed significant difference ($p=0.001$) at zero minute and after fifteen minutes ($p=0.270$) among post- surgical cardiac patient.

Hence the study showed that ice pack application was effective method ($p=0.01$) during chest tube removal.

A similar study conducted by Nurcan Ertug, to assess the effectiveness of cold application on pain during chest tube removal showed significant difference (1.13 ± 1.31 ; 0.27 ± 0.44 ; 0.27 ± 0.44) in pre- test and post- test (8.57 ± 0.49 ; 8.73 ± 0.57 ; 8.63 ± 0.48) at zero minute and 15 minute. Which is statistically significant at ($p < 0.05$) level. Hence the study resulted that ice pack application found to be effective on pain during chest tube removal.^[25]

Effect of ice pack application on physiological parameters during invasive line removal

The present study assessed the effect of ice pack application on heart rate during invasive line removal among post- surgical cardiac patient. Which showed that there is significant difference in post- test-1&2 ($p=0.045$), ($p=0.249$). Which revealed that HR shows significant changes ($p=0.201$) during invasive line removal, which was statistically proved ($p < 0.05$) Hence the study interpreted the effect of ice pack application showed significant changes on heart rate.

A similar study conducted by Erdogan A to assess the pain intensity after ice pack application on heart rate among cardiac surgery patents. The findings of the study shows that the pain occurred at different levels cause change in heart rate during ice application. The pain score after ice pack was (7.36 ± 1.34 and 7.88 ± 0.79) of the study. Thus the study concluded that there was a significant changes in heart rate after ice pack application.^[32]

Association between post- test pain score with selected demographical variable

In the present study the association between post-test and selected demographical variable were checked and found that there was no association between age ($p=0.776$),

gender ($p=0.136$), educational status($p=0.111$), occupation, type of work, personal habits, operative procedure, any previous surgery, no of invasive lines and removal of all invasive lines. The result is consistent with the study conducted by Irene Lie published that there was no association between the level of pain with selected demographic variables such as age,(80%) of elderly,(60%) of older adults gender($F = 40\%$), ($M = 35\%$). Which is statistically significant at ($p < 0.05$) level.^[46]

CONCLUSION

The present study assessed the effectiveness of ice pack application on pain and physiological parameters during removal of invasive lines among post- surgical cardiac patients. The major findings of the study revealed that there is significant difference in pre- test and post- test pain score. Which depict that ice pack application is effective on pain and physiological parameters during invasive line removal. This intervention can be added as an adjunct treatment for patients. This nursing intervention is simple and free from side effect so patient can use at home also to reduce pain.

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REFERENCES

- Sacco RL, Roth GA, Srinath R, Donna K A, Ruth B, Thomas A. et al. The heart of achieving the goal of reducing global and regional premature deaths from cardiovascular diseases and stroke. *American Heart Association and World Heart Federation Journal*, 2015; (133): 674–690.
- Vahanian A, Ottavio A, Felicita A, Manuel J A, Gonzalo B E, Helmut B, et al. Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology. Guidelines on the management of valvular heart disease, 2012; (33): 51-96.
- Bell T, Grady NP. Prevention of central line-associated bloodstream infections. *Infect Disease Clinical North American Journal*, 2017; (31): 551–559.
- Ertug N, Ulker S. The effect of cold application on pain due to chest tube removal. *Journal of clinical Nurses*, 2015; (21): 784–90.
- Hasanzadeh f, Kashouk NM, Shahram A, Javad A, Seyed Ahmad E, Hamidreza B, et al. The effect of cold application and lavender oil inhalation in cardiac surgery patients undergoing chest tube removal, 2016; 5(35): 76- 269.
- Layzell L. improving the management of postoperative pain *Nursing Times Journal*, 2015; 2(10): 34 -61.
- Bonica J J. Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. *International Association for the Study of Pain*, 2015; 6 (3): 247– 260.
- Miller-Keane M. *Encyclopaedia and Dictionary of Medicine. Nursing and Allied Health*, 2017; 2(7): 86-90.
- Mc Keating k. Remifentanyl for the insertion and removal of long-term central venous access during monitored anesthesia care, 2011; 4(23): 286– 292.
- Cowen R. Assessing pain objectively: the use of physiological markers *Anaesthesia*, 2015; 6(70): 828–847.
- Melzack R, Wall PD. Pain mechanisms: a new theory of Science, 2015; 19(150): 971–982.
- Demir Y, Khorshid L. The effect of cold application in combination with a standard analgesic administration on pain and anxiety during chest tube removal, *Journal of the American society of pain*, 2018; 11(3): 186-196.
- Global Atlas on Cardiovascular Disease Prevention and Control. World Health Organization and the World Stroke Organization, 2014; 3–18.
- Henry G. A Race against Time: The Challenge of Cardiovascular Disease in Developing EconomieIndia, 2014; 46-78.
- Milgrom LB, Brooks JA, Qi R, Bunnell K, Wuestfeld S, Beckman D, et al. Pain levels experienced with activities after cardiac surgery. *Am J Crit Care*, 2014; 13(2): 116-125.
- Yuva A. Effectiveness of local cold application on skin burns and pain after transthoracic cardioversion, 2018; 78-84.
- Friesner SA, Curry DM. Comparison of two pain management strategies during chest tube removal. *Heart Lung Journal*, 2016; 35(4): 269-76.
- Bleakley CM, GW Davison. The biochemical and physiological rationale for using cold-water immersion in sports recovery. A systematic review, 2015; 6(44): 179–187.
- Sauls J. The use of ice for pain associated with chest tube removal. *Pain Management Nursing*, 2012; 3(2), 44-52.
- KolE .Evaluation of the outcomes of ice application for the control of pain associated with chest tube irritation, *Pain Management Nursing*, 2013; 14(1): 29–35.
- Polit DF, Beck CT. *Nursing research*.10TH edition. Wolters Kluwer publications, 2017.
- Armendaris M, Azzolin K, Fabiane J M, Simone G R, Maria A, Pereira DM et al. Incidence of vascular complications in patients submitted to percutaneous transluminal coronary angioplasty by transradial and

- transfemoral arterial approach, 2018; 21(1): 107–111.
23. American Heart Association. Predictors of preventing complication after invasive percutaneous coronary intervention. <http://WWW.who.int/cardiac/complications/invasive-cardiovascular-procedures/en/> Retrieved on, 21-10-2014.
 24. Fang L. The effects of cryotherapy in relieving post arthroscopy pain. *Journal of Clinical Nursing*, 2011.
 25. NuncunErtug. The effect of cold application on pain due to chest tube removal. *Journal of Clinical Nursing*, 15(11): 10-15.
 26. Xavier M. Pain location distribution and intensity after Cardiac surgery. <http://www.mueller-clinic.com>.
 27. Demir Y, Khorshid, L. The effect of cold application in combination with standard analgesic administration on pain and anxiety during chest tube removal. *PainManagement Nursing*, 2012; 11(3): 188-96.
 28. Parkin PC, Lear N. Order of vaccine injection determines infant pain response. *Diseases in Children*, 2019; (163): 469–72.
 29. TL. Hudson, SF Dukes. Use of local anaesthesia for arterial punctures. *Journal of Am. J. Crit. Care*, 2016; 15(6): 595-99.
 30. Lins S, Guffey D. Decreasing vascular complications after percutaneous coronary interventions partnering to improve outcomes. *Journal of Crit Care Nurse*, 2016; 26(6).
 31. Roschkov S. & Jansen L. Coronary Artery Bypass Graft patients, pain perception during epicardial pacing wire removal. *Canadian Journal of Cardiovascular Nursing*, 14(3): 32-38.
 32. Kol E, Erdogan A, Karsh B. Evaluation of the outcomes of ice application for the control of pain associated with chest tube irritation. *Pain ManagNurs*, 2013; 14: 29–35.
 33. Mooventhan A, Nivethitha L. Scientific evidence-based effects of hydrotherapy on various systems of the body. *N Am J Med Sci.*, 2014; (6): 199-209.
 34. Arbour C. vital signs valid indicators for assessment of pain in post- operative cardiac surgery ICU adults. *Intensive Critical Care Nursing Journal*, 2016; 26(2): 83-90.
 35. Sendelbach, S E. Effects of music therapy on physiological and psychological outcomes for patients undergoing cardiac surgery. *Journal of Cardiovascular Nursing*, 2016; 21(3): 194-200.
 36. Hamid R K , Zahra E R, Aram F, Shahyad S A. Cold therapy for the management of pain associated with deep breathing and coughing post cardiac surgery, 2010; 20: 18–24.
 37. Vieira A, Oliveira A. B, Costa J. R, Herrera E, Salvini T. F. The effect of cryotherapy on nerve conduction velocity, pain threshold and pain tolerance. *British Journal of Sports Medicine*, 2013; 41(3): 365 – 369.
 38. Louis J, Schaal K, Bieuzen F, Le Meur Y,Filliard J-R, Volondat M, et al. Head exposure to cold during whole body cryostimulation: influence on thermal response andautonomic modulation. *Journal pone*, 2015; 10(4): 124-776.
 39. Esperanza H, Maria C S, Diana M, Tania F S.Cryotherapy in Sport Injury Management. *Champaign of human kinetics*, 2010; 56(4): 581–591. <https://doi.org/10.2522/ptj.20090131>.
 40. Miranda Ade, F. Evaluation of pain intensity and vital signs in the cardiac surgery post- operative period, 2014; 45(2): 327-333.
 41. HeidariGorji MA, BagheriNesami M, Ayyasi M, Ghafari R, Yazdani J. The effect of cold application on pain due to chest tube removal. *North American Journal of Medical Science*, 2014; 6(1): 19–24.
 42. Musculoskeletal health conditions represent a global threat to healthy aging. *World Health Organization World Report on Ageing and Health*, 2016; (56): 243–255.
 43. Parry, M. Pain experiences of men and women after CABG. *Journal of Cardiovascular Nursing*, 25(3): 20-21.
 44. Bowry DK, Lewey J, Dugani B, Jennifer L, Sagar BD, Niteesh KC, et al. “The burden of cardiovascular disease in low- and middle-income countries: epidemiology and management,” *Canadian Journal of Cardiology*, 2015; 31: 1151–1159.
 45. Parry M, Dhukai A, Clarke H, et al. *Journal of critical care nursing*, 2020 Mar 9; 10(3): 45-78.
 46. Laura van G, Linda I J, Sabine J.G.M, Ahlers P B, Antoine H G. DriessenP A. et al.The incidence of chronic post-sternotomy pain after cardiac surgery. *European Journal of Cardio-Thoracic Surgery*, 2011; 40(6): 1309–1313. <https://doi.org/10.1016/j.ejcts.2011.03.039>.
 47. Thomas M D, Volkmar F, Sebastian M, Anno M D,Roberto B, Friedrich M D et al. Pain and quality of life after minimally invasive versus conventional cardiac surgery, 2016; 45(5): 1643-1647.
 48. Sharma SK. *Nursing research and statistics*. Elseveir publishers, 2014; (2): 36-45.
 49. Polit DF, Beck CT. *Nursing research*. 10th edition. Wolters Kluwer publications, 2017.
 50. Sharma SK. *Nursing research and statistics*. 2nd edition. Elseveir publishers, 2014.