

A Study to Assess the Effectiveness of Ice Application on Pain Response Prior to Intravenous Procedures among Children at Tertiary Care Hospital

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Abstract

Children fear the most for pain from intravenous procedures during their hospitalization. The procedural pain is worse than the illness itself. Ice is a convenient topical refrigerant modality which can be used to reduce pain. The study was aimed to assess the pain response of children during intravenous procedures in experimental group and control group and the effectiveness of ice application on pain response during intravenous procedures among children and find association between pain score and selected demographic variables of children admitted in pediatric ward at Krishna Hospital and Medical Research Centre, Karad, Maharashtra, India. The study was two groups post-test only control group design. 60 children aged 6 -12 years were selected, 30 children in experimental and 30 in control group were the sample selected by Non probability purposive sampling technique. The result shows the mean pain score of experimental group was 0.66 and control group was 8.93. The unpaired t test value was 24.817 ($p < 0.01$), showing significant difference was present between mean pain score level among children in control and experimental group as p value < 0.05 . No significant association between pain scores and selected demographic variables of children in control group was present, whereas pain scores with age of children ($\chi^2 = 8.816$), gender of children ($\chi^2 = 5$), and weight of children ($\chi^2 = 4.909$) in experimental group had significant association. The study concluded that the ice application is a practical modality of choice, promote comfort and cost effective, means of reducing pain in children during intravenous procedures.

Keywords: Effectiveness, Ice Application, Intravenous, Pain Response, Procedures

1. Introduction

Child encounters disease and hospitalization as the first crisis¹. When children are hospitalized they have unfamiliar and unpleasant feeling. Children are inexperienced and have apprehension to pain and illness, so adverse feelings can cause coercion and agitation for them. Children undergoing needle sticks (injections, venipuncture, and blood withdrawal) prospect this procedure as fearsome and remarkable source of pain. Perception of pain in pediatrics is complex, and involves physiological, psychological, behavioral, and developmental factors².

Pediatric Intravenous (IV) procedure is practiced virtually in every health care setting and is an integral part of the modern medicine³. Intravenous procedure

produces maximum pain in pediatric children, so the children and their family members view this as a significant source of distress⁴.

Many non-pharmacological methods, such as diversion therapy and cutaneous stimulation are used to provide strategies to cope-up with pain. This helps in reducing perception of pain making it more bearable, decreasing the fear and enhancing the effectiveness of analgesia. From all these modalities, the appropriate use of cutaneous stimulation is effective in reducing the perception of pain. Cutaneous stimulation can be performed by handful methods such as simple rhythmic rubbing, use of pressure or electric vibrators, hand massage and application of heat or cold at the site before injection, which has been significantly valued in different studies⁵.

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Ice is been used from long ago as a topical pain reliever. It is an intervention that is natural, cost-effective, and easily accessible, accomplish skin anesthesia quickly and has no ill-effects and would be ideal to reduce pain in children. Ice works by certain mechanisms like reduction in conduction of peripheral nerve fibers, promoting sensory competition, and decreasing nociceptive mediators and inflammation. Although ice is not broadly used for reducing the procedural pain, it is been adopted and results have approved that it is a good anesthetic agent for subcutaneous and intramuscular injections⁶.

Children who are five years of age are capable to recognize the influence of pain and rate the intensity of pain⁷. The most commonly used assessment tool for children with four years of age group is Facial expression scales to obtain the self-report of pain⁸.

The Wong baker faces rating scale is recommended for children with age group of 3 years and older. Health care presonnels needs to point each face and convey the intensity of pain on the scale, and then ask the child to choose the face that most accurately represents his or her self level of pain⁹.

Considering the fear due to painful procedures and displeasing feelings the parents and the children get, it was taken in account that applying the ice would decrease the pain related to intravenous procedures.

2. Problem Statement

A study to assess the effectiveness of ice application on pain response prior to intravenous procedures among children at tertiary care hospital.

Objectives of the Study

- Assess the pain response of children during intravenous procedures in experimental group and control group.
- Assess the effectiveness of ice application on pain response during intravenous procedures among children.
- Find association between pain score and selected demographic variables of children.

Assumptions

The study assumes that,

- Intravenous procedure is a routine painful procedure for children.
- Ice decreases the sensitivity of tissue and create a sense of numbness.

Hypotheses

H₁: The pain score of experimental group after ice application will be significantly lower than the pain score of control group.

H₂: There will be significant association between pain score of children with selected demographic variables.

3. Materials and Methods

Evaluatory research approach and Post-test only control group design was used for the study. The study was conducted in Tertiary care hospital Karad. 60 children aged 6-12 years were selected, 30 children in experimental and 30 in control group were the sample selected by Non probability purposive sampling technique.

The Research Tool Consists of Two Sections

Demographic Performa of Children

A performa for selected personal information was used to collect the sample characteristics. Demographic variables consist of children age, sex, weight, religion, residence, type of family, previous experience of ice-application.

Wong-Baker Faces Pain Rating Scale

Explain to the child that each face is for a person who feels happy because they have no pain, (hurt) or sad because they have some or lot of pain.



Figure 1. Wong-baker faces pain rating scale.

Ask the child to choose the face that best represents how he or she feels. This pain scale is recommended for age 3 years and older.

4. Sampling Criteria

Inclusion Criteria

Inclusion criteria for sampling refers to the children,

- Within the age group of 6-12 years.
- Admitted to pediatric ward and undergoing intravenous procedures in Krishna hospital,
- Who was willing to participate in the study?

Exclusion Criteria

Exclusion criteria for sampling refers to children who were

- Chronically ill.
- Mentally handicapped.
- Admitted with surgical conditions.

Method of Data Collection

Formal written permission was obtained on 20.01.2016 ethical committee of KIMSDU, Karad and on 29.08.2016 from Medical Director, Krishna Hospital & Medical Research Centre, Karad. Data collection was conducted at Krishna Hospital, Karad from 24th October 2016 to 15th November 2016. Formal consent was obtained from the parents and purpose and procedure of the study was explained to the children and their parents. The ice cubes covered in gauze piece was applied on the site of venipuncture prior to intravenous procedures for 3 minutes. After 3 minutes of ice application pain was assessed by using Wong-Baker Faces Pain Rating Scale.

Procedure of Implementation of Ice Application

- The investigator obtained the formal permission from the selected hospital.
- The purpose of the study was been explained to the children and their parents.
- Informed written consent was been obtained from parents.
- The hand washing was done.
- The ice cubes covered in gauze piece was applied on the site of venipuncture prior to intravenous procedures for 3 minutes.
- After 3 minutes of ice application pain was assessed by using Wong-Baker Faces Pain Rating Scale.

5. Plan for Data Analysis

Raw data was collected and entered in master sheet for the statistical analysis. According to the objectives of the study, collected data was analyzed by descriptive and inferential statistics. The experts from the faculty of nursing and statistics consulted with the data analysis plan.

The plan for data analysis was as follows:

- Organized data in master sheet.
- Tabulation of data in terms of frequency, percentage, mean, SD, median and range to describe the data.
- Classification of pain scores is as follows:
- Mild Pain (0-2), Moderate Pain (4-6) & Severe Pain (8-10).
- Inferential statistics was used to draw the following conclusions:

Unpaired "T" test used for testing effectiveness of ice application and Chi-square test was used to the find association.

The data findings have been organized and presented under following sections:

Section 1: Distribution of Children According To Demographic Variables.

Section 2:

- Pain responses of children during intravenous procedures as per Wong Bakers Faces Rating Scale in experimental group and control group.
- Distribution of children According to pain Scores during intravenous procedures in experimental group and control group.
- Effectiveness of ice application on pain response during intravenous procedures among children.

Section 3: Association between pain score and selected demographic variables of children.

6. Results

Section 1: Distribution of Children According to Demographic Variables

Table 1. Frequency and Percentage distribution of children according to demographic variables (n= 30)

Sr.no	Variables	Control (n=30)		Experimental (n=30)	
		Frequency	Percent	Frequency	Percent
1	Age in years				
	≤ 6	6	20	9	30
	7--8	13	43	10	33
	9--10	2	7	5	17
	11--12	9	30	6	20
2	Gender				
	Male	19	63	18	60
	Female	11	37	12	40
3	Weight (in Kg)				
	≤ 18 kg	17	57	17	57
	>18 kg	13	43	13	43
4	Religion				
	Hindu	27	90	26	87
	Muslim	3	10	4	13
	Others	0	0	0	0
5	Residence				
	Urban	10	33	7	23
	Rural	20	67	23	77
6	Family Type				
	Nuclear	18	60	19	63
	Joint	12	40	11	37
7	Previous Experience of ice application				
	No	30	100	29	97
	Yes	0	0	1	3

The data presented in Table 1 reveals distribution of children according to demographic variables.

- In control group out of 30 children maximum 13(43%) were in age group of 7-8 years, 19(63%) were boys, 17(57%) were less than or equal to eighteen Kg, 27(90%) were Hindu 20(67%) lived in rural area, 18(60%) lived as nuclear family and 30(100%) children had no previous experience of ice application.
- In Experimental group out of 30 children 10(33%) were in age group of 7-8 years, 18(60%) were boys, 17(57%) were less than or equal to eighteen Kg, 26(87%) were Hindu, 23(77%) lived in rural area, 19(63%) lived in nuclear family and 1(3%) child had previous experience of ice application.

Section 2: A. Pain responses of children during intravenous procedures as per Wong Bakers Faces Rating Scale in experimental & control group.

Figure 2 reveals pain score wise distribution of children. In control group out of 30(100%) children according to

pain category maximum 17(57%) hurts worst, 11(37%) hurts whole lot, 1(3%) hurts even more and 1(3%) hurts little more.

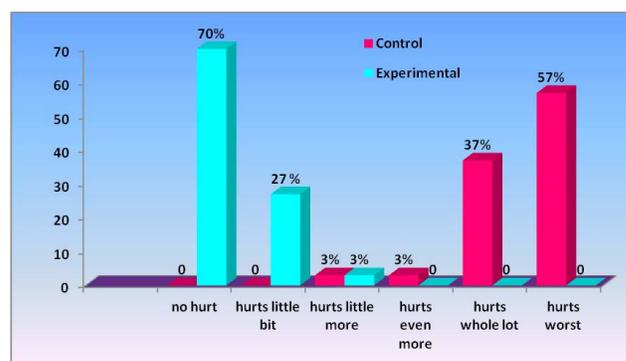


Figure 2. Showing frequency and percentage distribution of pain score of pediatric children.

In Experimental group out of 30(100%) children according to pain category maximum 21(70%) had no hurt, 8(27%) hurts little bit, 1(3%) hurts little more.

B: Pain Scores during intravenous procedures in experimental group and control group.

Table 2. Distribution of children according to pain scores during intravenous procedures in experimental group and control group

Pain Score	Control Group	Experimental Group
	n(%)	n (%)
Mild Pain (0-2)	0	29(97)
Moderate Pain (4-6)	2	1
Severe Pain(8-10)	28	0

n= 30

Table 2 shows the distribution of children as per pain score classification.

In the experimental group majority of subjects 29(97%) experienced mild pain, 1(3%) experienced moderate pain and zero percentage of severe pain.

In control group 28(93%) experienced severe pain. 2(7%) experienced moderate pain and zero percentage of mild pain in control group.

C. Effectiveness of ice application on pain response during intravenous procedures among children.

Table 3. Effectiveness of ice application on pain response during intravenous procedures among children

Parameters	Groups	Mean	Std. dev.	t statistic	p value
Pain level	Control	8.93	1.461	24.817	<0.01*
	Experimental	0.66	1.093		

*Mark represents significant value at 5% level of significance.

Unpaired t test was performed to check the difference for pain score level among children admitted in pediatric ward during intravenous procedures between control group and experimental group. It was found that mean pain score level was higher among children from control group (8.93) than experimental group (0.66). Significant difference was present between mean pain score level of children in control and experimental group as p value <0.05.

Table 4. Association between pain scores with demographic variables of control group

Demographic Variables	N	Control Group			Chi-square	P-value	Inference
		Mild	Moderate	Severe			
Age (in yrs.)							
≤6	6	0	0	6	2.802	0.4231	NS
7-8	13	0	2	11			
9-10	2	0	0	2			
11-12	9	0	0	9			
Sex							
Male	19	0	1	10	0.1968	0.6573	NS
Female	11	0	1	19			
Weight							
≤18	17	0	2	15	1.353	0.2448	NS
≥18	13	0	0	13			
Religion							
Hindu	27	0	2	25	0.2381	0.6256	NS
Muslim	3	0	0	3			
Others	0	0	0	0			
Residence							
Urban	10	0	1	9	0.2679	0.6048	NS
Rural	20	0	1	19			
Family Type							
Nuclear	18	0	2	16	1.429	0.232	NS
Joint	12	0	0	12			
Experience							
Yes	0	0	0	0	1.352	0.411	NS
No	30	0	2	28			

*Significant when P<0.05

Table 5. Association between pain scores with demographic variables of experimental group

Demographic Variables	N	Experimental Group			Chi-square	P-value	Inference
		Mild	Moderate	Severe			
Age (in yrs.)							
≤6	9	9	0	0	8.816	0.0318	S
7–8	10	10	0	0			
9–10	5	5	0	0			
11–12	6	5	1	0			
Sex							
Male	18	17	1	0	5	0.0253	S
Female	12	12	0	0			
Weight in kg							
≤18	17	17	0	0	0.7938	0.0267	S
≥18	13	13	1	0			
Religion							
Hindu	26	26	1	0	0.1149	0.7346	NS
Muslim	4	3	0	0			
Others	0	0	0	0			
Residence							
Urban	7	7	0	0	0.6536	0.4188	NS
Rural	23	22	1	0			
Family Type							
Nuclear	19	18	1	0	0.5489	0.439	NS
Joint	11	11	0	0			
Experience							
Yes	1	0	1	0	30.000	0.0001	NS
No	29	29	0	0			

*Significant when P<0.05.

Section 3: Association between pain score and selected demographic variables of children.

Table 4 reveals association between pain score and demographic variables in control group. There was no significant association between pain score and demographic variables in control group.

Table 5 reveals association between demographic variables and experimental group. There was significant association between pain score and demographic variables like age, gender and weight of children in experimental group as P < 0.05 and significant association was not found between pain score and demographic variables such as religion, residence, family type and experience of experimental group as P > 0.05.

7. Discussion

The present study was held to assess the ice application effectiveness on pain response prior to intravenous procedures among children. The study aimed to evaluate

effectiveness of ice application in reducing pain. The result shows the mean pain score of experimental group was 0.66 and control group was 8.93. The unpaired t test value was 24.817 (p<0.01), showing significant difference between mean pain score level among children in control and experimental group as p value <0.05. Significant association was not found between pain score and selected demographic variables of children in control group where as there was significant association of pain scores with age of children ($\chi^2 = 8.816$), gender of children ($\chi^2 = 5$), and weight of children ($\chi^2 = 4.909$) in experimental group.

A similar Quasi-experimental study was conducted in Iran to establish the effect of local refrigeration on pain responses prior to venipuncture in 80 school children of 6 to 12 years of age selected by purposive sampling technique, in pediatric emergency ward of pediatric centre. Results revealed that significant difference was not found in the two groups for physiological responses. Whereas behavioural responses during and after the procedure (p = 0.0011), and subjective responses after the

procedure ($p = 0.0097$) was significantly less. The study concludes local refrigerant prior to venipuncture can be considered as easy and effective method to decrease pain⁵.

The double-blind placebo-controlled study was conducted in community health clinics with ongoing immunization programs in Canada with purpose to find the outcome of a topical refrigerant anesthetic for reducing injection pain in randomly selected 90 preschool children from 4–5.5 years age experiencing routine Diphtheria-Pertussis-Tetanus (DPT) immunizations. The results of the study support the use of topical refrigerant anesthetic, as simple, effective treatment to reduce short-term painful procedures like injections¹⁰.

A study was conducted to evaluate efficacy of local cold therapy and distraction in pain relief using penicillin intramuscular injection in randomly choosed 90 samples of 5 to 12 years of age who had penicillin injection intramuscularly in a health centre. Results revealed the average pain intensity in local cold therapy, distraction, in control group was 26.3, 34.3, and 83.3, respectively. The findings indicate that pain intensity was significantly higher in the control group than in experimental group. Nurses are adviced to use cold therapy and distraction to decrease pain of penicillin intramuscular injection¹¹.

The results of the above studies supports the use of topical refrigerant anesthetic, as a pragmatic, simple intervention, and effective treatment modality for reducing short-term procedural pain.

8. Conclusion

The mentioned study concludes the mean pain score level was higher in children from control group (8.93) than experimental group (0.66). Hence ice application can be used as practical modality of choice that promotes comfort and cost effective, means of reducing intravenous pain in children.

9. References

1. Moghaddam K, Moghaddam M, Sadeghmoghaddam L, Ahmadi F. The concept of hospitalization of children from the view point of parents and children. *Iran J Pediatr.* 2011 Jun; 21(2):201–8.
2. Srouji R, Ratnapalan S, Schneeweiss S. Pain in children: Assessment and nonpharmacological management. *International Journal of Pediatrics.* 2010; 2010:1–11. Crossref PMID:20706640 PMCID:PMC2913812
3. Scales K. Intravenous therapy: A guide to good practice. *British Journal of Nursing.* 2008; 17(Sup8):S4–S12.
4. Humphrey G, Boon C, van den Heuvel G, van den Wiel H. Fear of needles: An assessment of 200 children and adolescents. *Journal of Pain and Symptom Management.* 1991; 6(3):182. Crossref
5. Rostami S, Salsali M, Movahedi A, Keikhaee B, Moradi A. Effect of local refrigeration prior to venipuncture on pain related responses in school age children. *Australian Journal of Advanced Nursing.* 2006 Dec-2007 Feb; 24(2).
6. Jacobson AF. Intradermal normal saline solution, self selected music and insertion difficulty effect in IV insertion pain. *Journal of Acute and Critical Care.* 2000; 28(2):114–22. Crossref PMID:10076111
7. Caty S, Ellerton M, Ritchie J. Use of a projective technique to assess young children's appraisal and coping responses to a venipuncture. *Journal for Specialists in Pediatric Nursing.* 1997; 2(2):83–92. Crossref
8. Hicks C, von Baeyer C, Spafford P, van Korlaar I, Goodenough B. The faces pain scale- revised: Toward a common metric in pediatric pain measurement. *Pain.* 2001; 93(2):173–83. Crossref
9. Goodenough B, Addicoat L, Champion G, McInerney M, Young B, Juniper K, et al. Pain in 4- to 6-year-old children receiving intramuscular injections: a comparison of the faces pain scale with other self-report and behavioral measures. *The Clinical Journal of Pain.* 1997; 13(1):60–73. Crossref PMID:9084953
10. Abbott K, Fowler-Kerry S. The use of a topical refrigerant anesthetic to reduce injection pain in children. *Journal of Pain and Symptom Management.* 1995; 10(8):584–90. Crossref
11. Hasanpour M, Tootoonchi M, Aein F, Yadegarfar G. The effects of two non-pharmacologic pain management methods for intramuscular injection pain in children. *Acute Pain.* 2006; 8(1):7–12. Crossref
12. Kuzu N, Ucar H. The effect of cold on the occurrence of bruising, haematoma and pain at the injection site in subcutaneous low molecular weight heparin. *International Journal of Nursing Studies.* 2001; 38(1):51–9. Crossref