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RESEARCH ARTICLE

COMPARISON OF EFFECTIVENESS OF ICE CUBE AND VAPOCOOLANT SPRAY AS AN ANESTHETIC PRE-TREATMENT FOR IM INJECTION AMONG PATIENTS IN SELECTED HOSPITAL, EAST SIKKIM

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ABSTRACT

Introduction: Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. The American Pain Society (APS) has officially declared pain as the fifth vital signs. Intramuscular (IM) injection is a common procedure that nurses frequently carry out and observe pain and distress to the recipient. The aim of the study was to compare the effectiveness of ice cube and vapocoolant spray as an anesthetic pre-treatment for IM injection among patients in selected hospital, East Sikkim. **Method:** A quantitative factorial design study was conducted on patients, receiving intramuscular tetanus toxoid injection at Central Referral Hospital, Gangtok, East Sikkim. Total 50 participants were selected using simple random sampling technique. The demographic data of the patients were collected using structured questionnaire and a Standardized Numerical Pain Rating Scale was used to assess the pain level after the administration of intramuscular tetanus toxoid injection using ice cube and vapocoolant spray as an anesthetic treatment. **Result:** The study findings highlights that the mean and SD for intensity of pain in ice cube group was 1.84 ± 1.313 and in vapocoolant group was 2.92 ± 1.470 with mean difference was 0.157 and ($t=2.740$ and $p=0.009$) and $p < 0.05$ level of significance which was statistically significant and indicates that ice cube was more effective than vapocoolant in reducing the intensity of pain among patients as an anesthetic pre-treatment for IM injection. The findings also revealed that there is no association between the level of pain with selected demographic variables. **Conclusion:** The study found that ice cube was more effective than vapocoolant spray to reduce the level of pain while administering IM injection. The study intervention would help the health care professionals mainly the staff nurses to execute the practice of using ice cube before IM injection to reduce pain.

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INTRODUCTION

Pain is a distressing feeling often caused by intense or damaging stimuli. The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.¹ It is officially declared as the fifth vital signs so the evaluation and management of pain has now become as much as important and basic as the assessment and the management of other vital signs which includes temperature, pulse and blood pressure.

Injection is the act of putting a liquid, especially a drug into a person's body using a needle and a syringe. Parenteral injection includes subcutaneous, intramuscular, intravenous, intraperitoneal, intracardiac, intraarticular and intracavernous injection.² In 2011, WHO stated that at least 16 billion injections are administered annually worldwide. The vast majority, around 95% are given in curative care. 3% are for immunization, and the rest for other purposes, such as blood transfusion.³

Among all the parenteral injections carried out, intramuscular injections are very common procedure followed by the nurse which causes certain discomfort and pain to the patient. Common injection sites include the deltoid, vastuslateralis, and ventrogluteal muscles. In India, 3 billion injections were estimated to be administered annually.³ In intramuscular injections, muscle needles are used which are longer than standard injection ones. Muscular injection needles reach the muscle, and don't remain under the skin or in the fatty tissue where the blood flow is much weaker than in the muscle. If the substance is left under the skin or in the fatty tissue, its absorption is blocked which can cause tissue damage and cause pain.² Intramuscular injection is a common procedure that nurses frequently carry out causing pain and distress to the recipient. The pain resulting from IM injection should not be neglected as the patient might develop the fear of needles and postpone in seeking medical help. It can also leave a bad impact on nurse-patient relationship. Tetanus toxoid vaccine is an inactive vaccine developed in 1924 used to prevent tetanus. Redness and pain at the site of injection occur in between 25% and 85% of people. Its use resulted in a 95% decrease in the rate of tetanus.⁴ Many studies have been conducted regarding pain resulting from administering injections which has come up with various pharmacological and non-pharmacological measures to reduce the pain. Beyond drugs, some of the non-pharmacological measures include acupuncture, physical therapy, gel packs, breathing techniques, tai chi technique, massage, biofeedback, hypnosis, exercise therapy, nerve stimulation etc.⁵

Out of various non-pharmacological measures, some of the easiest methods used for the management of pain are cold therapy and vapocoolant spray. The evidence regarding efficiency of cold applications and vapocoolant spray are limited and needs further researches. Cold application has been widely used for controlling pain in minor injuries, minor surgical procedures, and relieving pain or reducing pain this method reduces pain by eliminating edema and muscle spasm. Ice application is effective in relieving pain by slowing or blocking the conduction of peripheral nerves.⁶ It acts as skin anesthesia immediately after the application of ice and is easy to prepare. Vapocoolant sprays are also one of the cryotherapeutic topical agents which provide transient skin anesthesia within seconds of application and thus reduce pain for injections and other procedures. It is a method which is easy to use and also acts as anesthetic treatment quickly. Many studies have done regarding pain reduction after administration of injection.

MATERIALS AND METHODS

Research approach: A quantitative research approach

Research design: The research design adopted for the study was the Factorial design.

Setting: The study was conducted in Central Referral Hospital Gangtok, East Sikkim, Sikkim, India

Population: The sample for the study consisted of patients receiving intramuscular injection having 0-3 pain.

Sample: The population in the present study consists of patients attending Gynae OPD and admitted patients receiving intramuscular tetanus toxoid injection having 0-3 pain score.

Sample size: The sample size was 50.

Sampling technique: Sample technique used was simple random sampling technique.

Sampling criteria:

Inclusion criteria

- Patient above the age of 18 years who are receiving intramuscular tetanus toxoid injection having 0-3 pain score
- Patients who were willing to participate
- Patients who were available during data collection

Exclusion criteria

- Patients who are unconscious
- Patients who had undergone any painful procedure within 1 hour of the study
- Patients who are getting any form of IV or oral analgesics.

Data collection tools and techniques: Based on the objectives of the study the following tools were selected

Tools for data collection

Section: Demographic proforma with other factors.

Section 2: Numerical pain rating scale.

Development and description of tool: The tool was prepared on the basis of the study to assess the comparison of effectiveness of ice cube and vapocoolant spray as an anesthetic pre-treatment for IM injection among patients in Central Referral Hospital, East Sikkim.

Validity of the tool: The validity of the tool was established by a panel of 7 experts, selected based on their expertise and experience in the particular fields

Reliability of the tool: Reliability of the tool was calculated by intra rater and the 'r' was calculated through percentage of agreement to see the coefficient Correlation of equivalency which showed 100% agreement for all items

Data collection procedure: Data were collected in the month of November to December 2018 among 50 patients attending OPD and admitted in Central Referral Hospital receiving intramuscular tetanus toxoid injection having 0-3 pain score after getting administrative approval from the Principal, Sikkim Manipal College of Nursing to conduct the study. Formal permission from Medical Superintendent of Central Referral Hospital was taken. The purpose of the study was explained to the entire subject and written consent was obtained from all the subjects.

- 50 samples were selected by simple random sampling technique using lottery method.
- Again with the same lottery method, the selected samples were again classified into two groups for interventions i.e. ice cube (25 samples) and vapocoolant spray (25 samples)

- Data was collected by using self reports numerical pain rating scale and effectiveness between the two interventions were assessed.

Plans for data analysis: The data was planned to be analyzed by using descriptive and inferential statistics.

RESULTS

The data were organized under the following headings

Description of the demographic variables

Table 1. Frequency and percentage distribution of samples according to their demographic proforma

N=50 (25 for ice cube and 25 for vapocoolant each)

Sl.No	Demographic Variables	Ice cube		Vapocoolant spray	
		f	%	f	%
1.	Age				
	a.18-27 years	7	28	8	32
	b.28-37 years	5	20	14	56
	c.38 years and above	13	52	3	12
2	Sex				
	a.Male	8	32	5	20
	b.Female	17	68	20	80
3	Educational status				
	a.No formal education	5	20	1	4
	b.Undergraduate	17	68	17	68
	c.Graduate	1	4	7	28
	d.Post graduate	2	8	0	0
1.	Other factors				
	Site of injection	25	100	25	100
	•Deltoid muscle of arm				
2.	Volume of the drug	25	100	25	100
	•0.5 ml				
3.	Size of the needle	25	100	25	100
	•2ml syringe with 24G needle				

Description of the level of pain perception

Table 2. Frequency and percentage distribution of the level of pain perception among patients receiving intramuscular injection using ice cube and vapocoolant spray as an anesthetic pre treatment.

(25 for ice cube and 25 for vapocoolant each) N=50

Level of pain	Ice Cube		Vapocoolant spray	
	f	%	f	%
No pain	3	12	1	4
Mild pain	20	80	22	88
Moderate pain	2	8	1	4
Severe pain	0	0	1	4
Mean±SD	1.84±1.313		2.92±1.470	

Shows the level of intensity of pain on receiving ice cube and vapocoolant spray as an anesthetic pre-treatment for IM injection among patients. The result showed that in ice cube group 3(12%) had no pain, 20(80%) had mild pain and 2(8%) had moderate pain where as in vapocoolant group 1(4%) had no pain, 22(88%) had mild pain, 1(4%) had moderate pain and 1(4%) had severe pain.

Description of comparison of the level of pain

Shows the comparison between level of intensity of pain on receiving ice cube and vapocoolant spray as an anesthetic pre-treatment for IM injection among patients which was compared by using unpaired t test.

Table 3. Comparison between the level of pain experienced by patients receiving intramuscular injection using ice cube and vapocoolant spray as an anesthetic pre-treatment

N=50 (25 for ice cube and 25 for vapocoolant each)

Level of Pain	Mean	SD	Mean Difference	't' value	df	'p' value
Ice cube	1.84	1.313	0.157	2.740	48	0.009*
vapocoolant	2.92	1.470				

*p<0.05 level of significance Significant

The mean and SD for intensity of pain in ice cube group was 1.84±1.313 and in vapocoolant group was 2.92±1.470 with mean difference was 0.157 and (t=2.740 and p=0.009) indicates ice cube was more effective than vapocoolant in reducing the intensity of pain among patients as an anesthetic pre-treatment for IM injection.

Table 4. Association between the levels of pain on receiving ice cube as an anesthetic pre-treatment for IM injection among patients with their demographic variables

n=25

Demographic Variables	No pain	Mild pain	Moderate pain	Chi value	df	p value
Age						
a.18-27 years	1	5	1	1.344	4	0.854 NS
b.28-37 years	1	4	0			
c.38 years and above	1	11	1			
Sex						
a.Male	0	7	1	1.792	2	0.408 NS
b.Female	3	13	1			
Educational status						
a.No formal education	1	3	1	2.275	6	0.893 NS
b.Undergraduate	2	14	1			
c.Graduate	0	1	0			
d.Post graduate	0	2	0			

*p<0.05 level of significance

NS-Non significant

Description of association between the levels of pain with selected demographic proforma

Table 5. Association between the levels of pain on receiving vapocoolant spray as an anesthetic pre-treatment for IM injection among patients with their demographic variables

n=25

Demographic Variables	No pain	Mild pain	Moderate pain	Severe pain	Chi value	df	p value
Age							
a.18-27 years	1	6	1	0	12.12	6	0.059 NS
b.28-37 years	0	14	0	0			
c.38 years and above	0	2	0	1			
Sex							
a.Male	0	4	1	0	4.545	3	0.208 NS
b.Female	1	18	0	1			
Educational status							
a.No formal education	0	1	0	0	3.533	6	0.740 NS
b.Undergraduate	0	15	1	1			
c.Graduate	1	6	0	0			

*p<0.05 level of significance NS-Non significant

DISCUSSION

The findings of the study are discussed with reference to objectives and the findings of the previous studies. In the present study majority 20(80%) had mild pain, 3(12%) had no pain, and 2(8%) had moderate pain. This study is supported by a study conducted by A Farhadi and M Esmalizadeh²³ conducted a study on 'Effect of local cold on intensity of pain

due to penicillin benzathin intramuscular injection". 60 patients were taken and divided into case and control group. Data was collected using questionnaire and visual analog scale. The average intensity of pain for penicillin benzathin injection in the local cold group was 4/47+1/42 and in control group was 7/39+1/55. Results showed that local cold significantly decreased the intensity of pain due to penicillin benzathin IM injection ($P=0/000$). In the present study majority 22(88%) had mild pain, 1(4%) had no pain, 1(4%) had moderate pain and 1(4%) had severe pain. This finding is supported by a double-blind randomized controlled trial study conducted by Ken J. Farion, Karen L.S., et al.²⁸ "The effect of vapocoolant spray on pain. The findings of the study showed vapocoolant spray quickly and effectively reduced pain due to intravenous cannulation and improved the success rate of cannulation.

The findings of the present study showed that the mean and SD for intensity of pain in ice cube group was 1.84 ± 1.313 and in vapocoolant group was 2.92 ± 1.470 with mean difference was 0.157 and ($t=2.740$ and $p=0.009$) which indicates ice cube was more effective than vapocoolant in reducing the intensity of pain among patients as an anesthetic pre-treatment for IM injection. This study is contradicted by a prospective, randomized, controlled, clinical study by conducted by Akcimen M., Bedel C. and Selvi F.³⁵ "Application of ice and vapocoolant spray to reduce tetanus vaccine pain". The results showed that patients who were applied ice (5.3 ± 7.1) or vapocoolant spray (4.1 ± 5.4) at the time of intervention had statistically significantly lower VAS values than control group (8 ± 10.6).

Conclusion

The study was conducted to assess the effectiveness of ice cube and vapocoolant spray as an anesthetic pre-treatment for IM injection among patients in Central Referral Hospital, East Sikkim.

The study findings showed that ice cube was more effective than vapocoolant spray to reduce the level of pain while administering IM injection. There was no significant association found between the level of pain and their selected demographic variables. The study intervention would help the health care workers mainly the staff nurses to execute the practice of using ice cube before IM injection to reduce pain.

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