

A Comparative Study to Assess the Effectiveness of Moist Ice Pack versus Warm Glycerin Magnesium-Sulphate Application in Reduction of Pain among Patients with IV Infusion

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Abstract: *The intravenous infusion is an important aspect of therapy under both medical and surgical conditions. Physiologic homeostasis within the body requires the presence of an adequate supply of fluids. The fluids circulating the body are composed of water, electrolytes, minerals and cells. Their imbalances may result from many factors like injury, surgery and different kinds of medical illnesses. These imbalances can be corrected by intravenous therapy. Intravenous therapy has become a life-saving as well as life sustaining therapy and the intravenous therapy is increasingly being performed by nursing staff in hospitals. Nurses spend upto 2/3rd of their time for IV therapy related responsibilities. Therefore, initiating IV infusion is a challenging skill in nursing.*

Keywords: IV Infusion

I. INTRODUCTION

The intravenous infusion is an important aspect of therapy under both medical and surgical conditions. Physiologic homeostasis within the body requires the presence of an adequate supply of fluids. The fluids circulating the body are composed of water, electrolytes, minerals and cells. Their imbalances may result from many factors like injury, surgery and different kinds of medical illnesses. These imbalances can be corrected by intravenous therapy. Intravenous therapy has become a life-saving as well as life sustaining therapy and the intravenous therapy is increasingly being performed by nursing staff in hospitals. Nurses spend upto 2/3rd of their time for IV therapy related responsibilities. Therefore, initiating IV infusion is a challenging skill in nursing¹.

Infiltration occurs when a catheter (or) needle penetrates the vessel wall during venipuncture (or) later slip out of the vein and allows intravenous solution to flow into surrounding tissues. This is manifested as swelling from increased tissue fluid around the venipuncture site, pallor, warmth, decreased flow of rate, stop of flow and pain resulting from edema and increasing proportionately as the infiltration worsens³.

Warm Glycerin magnesium sulphate application can act by the osmotic action of the Glycerin magnesium sulphate enabling the movement of fluid from the interstitial space with the skin acting as the membrane between Topical magnesium sulphate has been used traditionally in the treatment of abscess by causing vasodilation and resolving by pointing of pus. Glycerin acts as a solvent of magnesium sulphate and its hygroscopic action helps in reducing swelling due to interstitial fluid. The warmth generated acts by vasodilation to improve fluid reabsorption and can reduce swelling and pain.

II. MATERIALS AND METHODS

An experimental descriptive research design to find out effectiveness of moist ice pack versus warm glycerine magnesium sulphate application in reduction of pain and inflammation among adult patients with IV infusion site. The study conducted on 30 samples. Data was collected in the month of December to January 2022. Data was collected using

structured questionnaire related to Details of IV therapy with cannula such as location of the IV cannula, type of IV cannula, size of IV cannula, type of IV fluid, rate of flow during the last 24 hours, duration of IV therapy, disease condition, presence of signs and symptoms of IV infusion site superficial thrombophlebitis and numerical rating pain scale to find out effectiveness of moist ice pack versus warm glycerin magnesium sulphate application in reduction of pain and inflammation among adult patients with IV infusion site.

III. RESULTS

The data revealed that, Majority of the respondents (50%) were 3 years old. A dominant portion of the respondents were female (53.33%), 60% of the respondents were Hindu, Most of the respondents (70%) had a severe health problem. Majority of the respondents were admitted in the hospital for the last 6 to 12 days and 66.67% of the respondents did not have a previous history of hospitalization.

In the pretest, majority of the respondents (53.33%) had moderate pain and the remaining 46.66 percentage had a severe pain associated with IV infusion. None of the respondents had mild pain. In the posttest, majority (60%) had only mild pain associated with IV infusion and only 40% of them had a moderate pain. None of the respondents in the post test experienced a severe pain associated with the procedure in the post test.

Respondents in the group 1 which received moist ice pack as intervention exhibited a mean pain score of 5.2 (34.66%) in the pre-test with a standard deviation of 1.68. In the post test it was reduced to 2.6 (17.33%) with SD 1.36. The paired t test value obtained was 8.38 which was greater than the table value at 0.001 level of significance. Hence the hypothesis was accepted for the first group and this proved that moist ice pack application significantly reduced the pain of the respondents associated with IV infusion.

With regard to the second group which received warm glycerin-magnesium sulphate application, mean pain score in the pre-test was 4.9 (32.54%) with standard deviation of 1.43. It was reduced to 2.8 (18.43%) in the post test with SD of 1.12. Paired t test was used to find out the significance and the obtained t value was 6.34 with df of 14. The obtained t value was greater than the table value at 0.001 level of significance. Hence the hypothesis was accepted and the warm glycerin-magnesium sulphate application was highly effective in reducing the pain among the children

It is undoubtedly clear from the above data that the t test value obtained for group 1 which received moist ice pack was greater than that of group 2 which received warm glycerin-magnesium sulphate application. Data further reveals that there was a significant difference of 2.04 in the t test score between the two groups. Hence it was observed that moist ice pack is more effective in reducing the pain associated with IV infusion than Warm Glycerin magnesium Sulphate.

The chi square test could not find any association between the pain scores of the children with demographic variables. Hence the hypothesis "there is a significant association between the pain scores and the demographic variables of the respondents" was rejected.

IV. CONCLUSION

After the detailed analysis of the study findings showed that majority of the respondents (50%) were 3 years old. A dominant portion of the respondents were female (53.33%) and 60% of the respondents were Hindu. Most of the respondents (70%) had a severe health problem, majority of the respondents were admitted in the hospital for the last 6 to 12 days and 66.67% of the respondents did not have a previous history of hospitalization

The present study was also able to prove the hypothesis that moist ice pack and warm glycerin-magnesium sulphate would reduce the pain of children associated with the IV infusion. The study also showed that moist ice pack was more effective than warm glycerin-magnesium sulphate in reducing the pain. However, the study could not find any association between the demographic variables of the respondents with their pre-test pain scores.

V. INTRODUCTION

The history of intravenous therapy originated with the discovery of circulation by William Harvey. The first practical application was by Dr. Thomas Latta, who used infusion of saline to treat the intractable diarrhoea. Approximately 90% of patients in acute care setting receive some form of intravenous infusion therapy (Jenise Willin, 1999).¹

The intravenous infusion is an important aspect of therapy under both medical and surgical conditions. Physiologic homeostasis within the body requires the presence of an adequate supply of fluids. The fluids circulating in the body are

composed of water, electrolytes, minerals and cells. Their imbalances may result from many factors like injury, surgery and different kinds of medical illnesses. These imbalances can be corrected by intravenous therapy. Intravenous therapy has become a lifesaving as well as life sustaining therapy and the intravenous therapy is increasingly being performed by nursing staff in hospitals. Nurses spend up to 2/3rd of their time for IV therapy related responsibilities. Therefore, initiating IV infusion is a challenging skill in nursing¹.

Administering drugs by the intravenous route has advantages. Often the nurse uses the intravenous route in emergencies when a first acting drug must be delivered quickly. The intravenous route is also best when constant therapeutic blood levels must be established. Some medications are highly alkaline and irritating to muscles and subcutaneous tissues. These drugs cause discomfort when given intravenously².

Infiltration occurs when a catheter (or) needle penetrates the vessel wall during venepuncture (or) later slip out of the vein and allows intravenous solution to flow into surrounding tissues. This is manifested as swelling from increased tissue fluid around the venepuncture site, pallor, warmth, decreased flow of rate, stop of flow and pain resulting from oedema and increasing proportionately as the infiltration worsens³.

Factors associated with the development of infiltration are integrity and state of veins, insertion technique, cannula location, insertion into the bony extremity (or) movable joints, size of cannula, use of steel needles, infusion of certain drugs, duration of therapy, increased length of time over 24hrs, blood flow problems in the region, hyperosmolar parenteral fluids, pH, acidic infusates, chemotherapeutic drugs and duration of soft tissue exposure to vesicants⁴.

Local responses to warm and cold occur through stimulation of temperature sensitive receptors in the skin. Impulses travel from the periphery to the hypothalamus and the cerebral cortex. The hypothalamus then initiate heat producing (or) heat reducing location of the body. The conscious sensation of temperature are aroused in the cerebral cortex. These interventions are effective by decreasing swelling through cold application, decreasing stiffness through warm magnesium sulphate application and increasing large diameter nerve fibre input to block small diameter pain fibre messages by cold and warm application. [C. Delaune – 2000]⁵.

Warm Glycerine magnesium sulphate application can act by the osmotic action of the Glycerine magnesium sulphate enabling the movement of fluid from the interstitial space with the skin acting as the membrane between Topical magnesium sulphate has been used traditionally in the treatment of abscess by causing vasodilation and resolving by pointing of pus. Glycerine acts as a solvent of magnesium sulphate and its hygroscopic action helps in reducing swelling due to interstitial fluid. The warmth generated acts by vasodilation to improve fluid reabsorption and can reduce swelling and pain.

VI. OBJECTIVES OF STUDY

1. To assess the level of pain at IV infusion site of the participants in the pre-test.
2. To assess the level of pain at IV infusion site of the participants in the post test.
3. To evaluate the effectiveness of moist ice pack on reduction of pain at IV infusion site by comparing pre and post-test pain scores.
4. To evaluate the effectiveness of warm Glycerine magnesium sulphate application on reduction of pain at IV infusion site by comparing pre and post-test pain scores.
5. To compare the effectiveness of moist ice pack with that of warm Glycerine magnesium sulphate application
6. To find out the association between pre-test level of pain with selected demographic variables.

VII. MATERIALS AND METHODS

An experimental descriptive research design to find out effectiveness of moist ice pack versus warm glycerine magnesium sulphate application in reduction of pain and inflammation among patients with IV infusion site. The study conducted on 30 samples. Data was collected in the month of December to January 2022. Data was collected using structured questionnaire related to Details of IV therapy with cannula such as location of the IV cannula, type of IV cannula, size of IV cannula, type of IV fluid, rate of flow during the last 24 hours, duration of IV therapy, disease condition, presence of signs and symptoms of IV infusion site superficial thrombophlebitis and numerical rating pain scale to find out effectiveness of moist ice pack versus warm glycerin magnesium sulphate application in reduction of pain and inflammation among adult patients with IV infusion site. Data was collected with following structured tool.

Part 1: socio-demographic characteristics of the respondents

It consisted of Age of the child, Gender of the child, Religion, Health Status of the child, Duration of hospital stay, History of previous hospitalization

Part 2: Pediatrics Pain Scale (PPS)

The Pediatric pain scale is a behavioral assessment tool for measurement of pain in children under the age of 5. This can be used to monitor a child before, during and after a painful procedure such as venipuncture or IM injection. It was developed at the Children's hospital of Eastern Ontario.

There are six parameters measured in this scale to determine the pain in children which are facial expression, cry, breathing pattern, arms, legs and state of arousal. The maximum score is 7 which indicates that the child is experiencing severe pain and the minimum score is zero which indicates that there is no pain.

The content validity of questionnaire was established by experts. The experts were selected on the basis of their expertise, experience and interest in the problem being studied. They were from different specialties i.e. Nursing, Medical Surgical Health Nursing, Education, Research, and Statistics. They were requested to give their opinions on the appropriateness and relevance of the items in the tool. Necessary modifications were made as per the expert's advice. The reliability of tool was 0.80.

Final study was conducted on 30 samples. Data was collected in the month of December to January 2022. The sample for the study comprised of patients, who met the designated criteria were selected through convenient sampling technique. Objectives of study was discussed and obtained consent for participation in study. Base line data was assessed by administering a structured assessment questionnaire and pain assessment scale. Based on the objective and the hypothesis the data was analyzed by using various statistical tests i.e. percentage, mean, t test and chi square test.

7.1 Statistical Methods

The data collected from the participants was planned to be analyzed on the basis of the objectives of the study using descriptive and inferential statistics. Data was organized data in a master data sheet.

- Demographic variables were analyzed in terms of frequency and percentage.
- Score of pain scale was presented in form of mean, median and standard deviation.
- Chi-square was used to determine the association between demographic variables and the pain experienced.
- Paired 't' test was used to determine the effectiveness of moist ice pack over warm glycerin-magnesium sulphate application.

VIII. RESULTS

Section I: Description of Socio demographic data of patients

Findings of section I table 1 shows that out of 30 Samples 50 % of the respondents were 3 years old, 33.30% of the respondents were 4 years, 10% were 2 years and 6.06 % of the respondents were 1 year old whereas 43.3 % (n=14) of the respondents were male and 53.3 % (n=16) were female. Majority of the respondents were Hindus (60 %) and 26.66 % of respondents were Muslims and 13.3 % were Christians. 21 (70 %) respondents were having severe health problem, 5 (16.67%) were having moderate health problems and those with mild and profound health issues were 6.67% (2). Table also depicts that the distribution of respondents according to duration of hospital stay. 33.33 % of the respondents were admitted for 6 to 12 days, 26.67% were admitted for more than 12 days, while 20% of them were admitted for less than a day and another 20% within 1 to 5 days in which 66.66 % (10) of the respondents had no history of previous hospitalization while 33.33 % (10) were having a history of previous hospitalization.

Table 1: Frequency & Percentage Distribution of Demographic Characteristics

Sr.	Variables	Number	Percentage
Age			
1.	1 year	2	6.6%
2.	2 years	3	10%
3.	3 years	15	50%
5	4 years	10	33.3%

Gender			
1.	Male	14	46.6 %
2.	Female	16	53.3 %
Religion			
1.	Hindu	18	60%
2.	Christian	4	13.33 %
3.	Muslim	8	26.66 %
4.	Others	0	00%
Gestational age			
1.	Mild health problem	2	6.67 %
2.	Moderate health problem	5	16.67 %
3.	Severe health problem	21	70%
4.	Profound health problem	2	6.67%
Duration of Hospitalization			
1.	Less than one day	6	20%
2.	1 day to 5 days	6	20%
3.	6 to 12 days	10	33.33%
4.	More than 12 days	8	26.67%
History of previous hospitalization			
1.	Yes	10	33.33 %
2.	No	20	66.67 %

Section II: Distribution of respondents according to pain score in the pre-test and post-test

Sr.	Pediatric Pain Scale	Category	pain score in the pre-test		pain score in the post-test	
			Frequency	Percentage	Frequency	Percentage
1.	0 - 2	Mild pain	0	00.00%	18	60.00%
2.	3 - 5	Moderate pain	16	53.33%	12	40.00%
3.	6 - 8	Severe pain	14	46.66%	00	00.00%

Table 2 depict the distribution of respondents according to their pain scores in pre and post-test.

In the pre-test 53.33% of the children experienced moderate pain and the remaining 46.66% had severe pain. Whereas after the administration of moist ice pack or warm glycerin-magnesium sulphate majority (60%) had only mild pain and the remaining 40% had moderate pain scores.

SECTION III (A): Effectiveness of Moist ice pack on reduction of pain

Sr.	Variables	Mean	Mean%	SD	T _{Cal} Value	Inference
1.	Pre-Test	5.2	34.66%	1.68	8.38	Significant
2.	Post - Test	2.6	17.33%	1.36		

Table 3 represents the effectiveness of moist pack in reduction of pain.

The mean pain score in the pretest was 5.2 (34.66%) with standard deviation of 1.68. It was reduced to 2.6 (17.33%) in the post test with SD of 1.36. Paired t test was used to find out the significance and the obtained t value was 8.38 with df of 14. The obtained t value was greater than the table value at 0.001 level of significance. Hence the hypothesis was accepted and the moist ice pack was highly effective in reducing the pain among the children.

SECTION III (B): Effectiveness of warm glycerin-magnesium sulphate on reduction of pain

Sr.	Variables	Mean	Mean%	SD	T _{Cal} Value	Inference
1.	Pre-Test	4.9	32.54%	1.43	6.34	Significant
2.	Post - Test	2.8	18.43%	1.12		

Table 4 represents the effectiveness of warm glycerin-magnesium sulphate application in reduction of pain.

The mean pain score in the pre test was 4.9 (32.54%) with standard deviation of 1.43. It was reduced to 2.8 (18.43%) in the post test with SD of 1.12. Paired t test was used to find out the significance and the obtained t value was 6.34 with df of 14. The obtained t value was greater than the table value at 0.001 level of significance. Hence the hypothesis was accepted and the warm glycerin-magnesium sulphate application was highly effective in reducing the pain

SECTION IV: Comparison between moist ice pack and warm glycerin-magnesium sulphate

Sr.	Variables	T Value	Difference	Inference
1.	Group 1 (Moist Ice Pack)	8.38	2.04	Significant
2.	Group 2 (Warm Glycerin magnesium Sulphate)	6.34		

Table 5 compare the effectiveness of moist ice pack with that of warm glycerin-magnesium sulphate application in reducing the pain among children, by comparing the t test value obtained.

It is undoubtedly clear from the above data that the t test value obtained for group 1 which received moist ice pack was greater than that of group 2 which received warm glycerin-magnesium sulphate application. Data further reveals that there was a significant difference of 2.04 in the t test score between the two groups. Hence it was observed that moist ice pack is more effective in reducing the pain associated with IV infusion than Warm Glycerin magnesium Sulphate.

SECTION V: Association of pain among children with selected demographic variables

Variables	Categories	Pre test scores		Total	Chi square values
		Moderate	Severe		
Age	1 years	2	0	2	0.207 df 3 Table value - 7.815 NS
	2 years	2	1	3	
	3 years	8	7	15	
	4 years	4	6	10	
	Total	16	14	30	
Gender	Male	8	6	14	0.47 df 2 Table value - 5.991 NS
	Female	8	8	16	
	Total	16	14	30	
Religion	Hindu	10	8	18	0.05 df 1 table value - 3.841 NS
	Christian	2	2	4	
	Muslim	4	4	8	
	Total	16	14	30	
Health status	Mild	2	0	2	0.498 df 3 Table value - 7.815 NS
	Moderate	3	2	5	
	Severe	10	11	21	
	Profound	1	1	2	
	Total	16	14	30	
Duration of hospital stay	Less than one day	4	2	6	0.835 df 3 Table value - 7.815 NS
	1-5 days	3	3	6	
	6-12 days	6	4	10	
	> 12 days	3	5	8	
	Total	16	14	30	
H/O previous hospitalization	Yes	6	4	10	0.057 df 2 Table value - 5.991 NS
	No	10	10	20	
	Total	16	14	30	

Table 5 depicts that Association of pain among children with selected demographic variables

The chi square test could not find any association between the pain scores of the children with demographic variables. Hence the hypothesis “there is a significant association between the pain scores and the demographic variables of the respondents” was rejected.

8.1 Discussion

SECTION I: DEMOGRAPHIC PROFILE OF RESPONDENTS

Majority of the respondents (50%) were 3 years old, A dominant portion of the respondents were female (53.33%), 60% of the respondents were Hindu, Most of the respondents (70%) had a severe health problem, Majority of the respondents were admitted in the hospital for the last 6 to 12 days and 66.67% of the respondents did not have a previous history of hospitalization

SECTION II: COMPARISON OF PRE AND POST TEST PAIN SCORES

In the pretest, majority of the respondents (53.33%) had moderate pain and the remaining 46.66 percentage had a severe pain associated with IV infusion. None of the respondents had mild pain. Whereas in the post test, majority (60%) had only mild pain associated with IV infusion and only 40% of them had a moderate pain. None of the respondents in the post test experienced a severe pain associated with the procedure in the post test.

SECTION III: EFFECTIVENESS OF INTERVENTIONS & ITS COMPARISON

Respondents in the group 1 which received moist ice pack as intervention exhibited a mean pain score of 5.2 (34.66%) in the pre-test with a standard deviation of 1.68. In the post test it was reduced to 2.6 (17.33%) with SD 1.36. The paired t test value obtained was 8.38 which was greater than the table value at 0.001 level of significance. Hence the hypothesis was accepted for the first group and this proved that moist ice pack application significantly reduced the pain of the respondents associated with IV infusion. Whereas in second group which received warm glycerine-magnesium sulphate application, mean pain score in the pre-test was 4.9 (32.54%) with standard deviation of 1.43. It was reduced to 2.8 (18.43%) in the post test with SD of 1.12. Paired t test was used to find out the significance and the obtained t value was 6.34 with df of 14. The obtained t value was greater than the table value at 0.001 level of significance. Hence the hypothesis was accepted and the warm glycerine-magnesium sulphate application was highly effective in reducing the pain among the children. It is undoubtedly clear from the above data that the t test value obtained for group 1 which received moist ice pack was greater than that of group 2 which received warm glycerine-magnesium sulphate application. Data further reveals that there was a significant difference of 2.04 in the t test score between the two groups. Hence it was observed that moist ice pack is more effective in reducing the pain associated with IV infusion than Warm Glycerine magnesium Sulphate.

SECTION V: ASSOCIATION OF DEMOGRAPHIC VARIABLES WITH PRE TEST SCORES

The chi square test could not find any association between the pain scores of the children with demographic variables. Hence the hypothesis “there is a significant association between the pain scores and the demographic variables of the respondents” was rejected.

IX. CONCLUSION

The conclusions were drawn on the basis of the findings of the study that moist ice pack and warm glycerin-magnesium sulphate would reduce the pain of children associated with the IV infusion. The study also showed that moist ice pack was more effective than warm glycerin-magnesium sulphate in reducing the pain. However, the study could not find any association between the demographic variables of the respondents with their pre-test pain scores.

9.1 Implications

The findings of the study have certain important implications for the nursing profession in the field of Nursing Practice, Nursing Education, Nursing Administration, Nursing Research and Community Health Nursing.

9.2 Nursing Service

1. The children constitute a large segment of the population. Due to improved prenatal care, health visits, healthy habits and balanced food reduce the death rate of children. Under-five are more prone for infection due to low immune status during the early period of life.. The injections are always very painful to the babies that makes

the nurse to think about various methods for reducing the pain during IV injections and infusions. So in no other areas of nursing is it more important for nurses to practice holistic nursing than with the children.

2. Child mortality is the death of an infant in the early years of life. Major causes of child mortality include dehydration, infection, congenital malformation and SIDS. This epidemiological indicator is recognized as a very important measure of the level of health care in a country because it is directly linked with the health status of children, and pregnant women as well as access to medical care, socioeconomic conditions, and public health practices and it is the duty of the nurse to take care of them.
3. Nursing the child is a multifaceted, challenging process because of the multiple changes occurring at this time in the life cycle and the way in which each change affects every aspects of the individual. Medical health services could be provided to the babies with their mothers in a variety of setting including general hospital, nursing home, maternity hospitals, and primary health centers and even at the person's own home itself by health visitors as a part of universal immunization etc.
4. As a primary care giver the Pediatric nurse must be proficient enough at assessing cognitive, affective functional, physical and behavioral status of the child.
5. As a consultant, the Pediatric nurse assists other providers of services to the child to address the growth and development of them.

9.3 Nursing Education

1. Since mortality and health problems is a growing problem, more emphasis should be given to the neonatal and Pediatric nursing in the curriculum.
2. Educational visits to the referral hospitals and in community areas can be arranged for the students to find out the needs and problems of the children residing over there.
3. Training of the care takers of child regarding identifications of health problems and taking necessary steps to solve them can be of great asset in organizing health programs for newborn.

9.4 Nursing Research

Pediatrics is one of the most neglected field of nursing in India. So the study conducted gives interest to other investigators to carry out further studies in this area. This might lead to the way to many researchers in the field of neonates.

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