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Wai Hnin Phyu
Staff Nurse, B.N.Sc, M.N.Sc
(Child Health Nursing),
Yangon Children Hospital,
Yangon, Myanmar

Myo Myo Aye
Tutor, B.N.Sc, M.N.Sc
(General Health Nursing),
Department of Maternal and
Child Health Nursing,
University of Nursing,
Yangon, Myanmar

Hninn Ei Phyu
Tutor, B.N.Sc, M.N.Sc (Child
Health Nursing), Department
of Maternal and Child Health
Nursing, University of
Nursing, Yangon, Myanmar

Corresponding Author:
Wai Hnin Phyu
Staff Nurse, B.N.Sc, M.N.Sc
(Child Health Nursing),
Yangon Children Hospital,
Yangon, Myanmar

Effect of cold application combined with distraction on venipuncture pain among children

Wai Hnin Phyu, Myo Myo Aye and Hninn Ei Phyu

Abstract

Optimal pain management is not only an ethical practice, but also a fundamental human right. The present study aimed to study the effect of cold application combined with distraction on venipuncture pain among children at the Outpatient Department in Yangon Children Hospital by using randomized controlled trial study design. The total 124 participants were collected by using consecutive sampling and randomized into the intervention group and control group according to computer generated randomized table. Faces pain scale (revised) was used to determine the pain of children due to venipuncture. The Mann-Whitney U test was used to compare the pain scores between two groups. The study resulted that cold application and distraction have a strongly significant effect on venipuncture pain among children ($U=508.5$; $z=-6.71$; $p<0.001$). The pain scores in the intervention group was over 15 times lower when compared to pain scores in the control group ($OR=15.885$; $95\%CI (3.197-78.939)$; $p=0.001$). The simplicity, applicability, safety, cost-effectiveness and possible benefits of the interventions in this study should be one of the utilizations in the management of pain in children.

Keywords: cold application, distraction, venipuncture pain, children

1. Introduction

Children have often been experiencing unpredictable and procedural related pain in hospitals that results in negative emotional and psychological implications. Exposing to painful procedures especially venipuncture is usually at emergency unit, on admission, during hospitalization and or during follow up visits. The simple insertion of needles is one of the most traumatic medical procedures for children and it makes experiences in frightening and distressing for children and even for parents during hospitalization^[1].

Optimal pain management is a good process and it is not only an ethical practice, but also a fundamental human right. Pain in children is a global health concern and become major significance in the most parts of the world^[2]. As to provide support for children, nursing care has been necessitated to minimize emotional and physical effects of painful procedures from the holistic point of view.

Today's, the health care for children leads towards the atraumatic care. It is one of the most dramatic advances in pediatric nursing and based on the principle of avoiding harm. Atraumatic care is the provision of therapeutic care in setting through the use of interventions that eliminate or minimize psychological and physical distresses experienced by children and the families in health care system^[3].

When enforcing and handling with pain in the children, non-pharmacological measures should be preferred as base line interventions than in conjunction with pharmacological selections to help lower levels of pain. The useful strategies involves the psychological comfort measures such as relaxation techniques and distraction as well as physical interventions including the use of massage, repositioning or heat and or cold applications^[4].

Needle-related medical procedures are unavoidable for hospitalized children and children who are taken to hospital for the health deterioration and seeking care in which if it is necessary^[5]. Among the common therapeutic procedures, invasive procedure such as venipuncture is the most commonly experienced and distressing events in pediatric population and it has been reported as one of the largest sources of pain in the hospitalized children that in case of failure to use appropriate strategies to relieve the pain and the risk of adverse physical outcomes^[6]. Moreover, children are receiving 18 million needle stick per year. Pain perception of the children during venipuncture shows that majority of children (66.7%) experienced severe pain during venepuncture^[7]. Furthermore, it was revealed that 36% of children suffered moderate pain and 26% of children suffered severe pain with

needle related procedure especially in venipuncture during hospitalization in Yangon Children Hospital [8].

Providing to reduce physical and emotional effects of painful procedures in children through pain management is an integral part of nursing practice. Nurses have most frequent contact with the patient than any other health care professionals and spend more time with children in pain. Non-pharmacological methods are generally safe and cost effective for patients and can be performed independently by a nurse. Therefore, this study was focused on the non-pharmacological pain management by studying the effect of cold application combined with distraction on venipuncture pain among children.

1.1 Research Hypotheses

H1: Cold application combined with distraction will have significant effect on venipuncture pain among children.

1.2. Objectives

General Objective

1. To study the effect of cold application combined with distraction on venipuncture pain among children
- Specific Objectives. To describe socio-demographic characteristics of the study population
2. To determine the pain scores of children in combined intervention (cold application and distraction) group and control group
3. To compare the pain scores of children between two groups

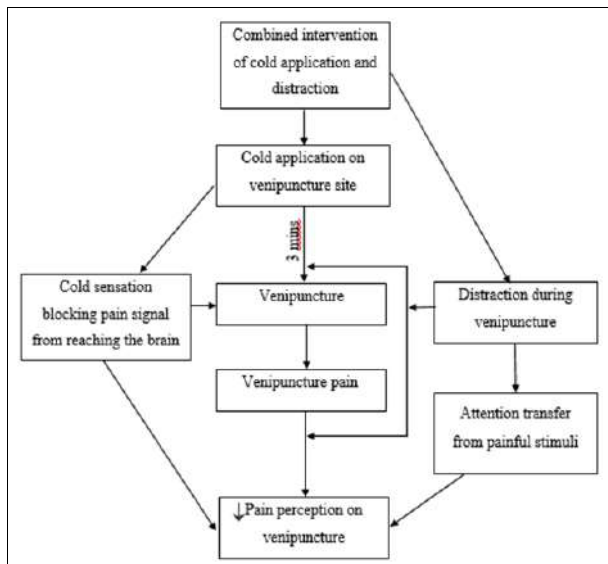


Fig 1: Conceptual framework of the study

2. Research methodology

2.1. Study Design

Randomized controlled trial design was used in this study.

2.2. Study Area and Study Period

The study was conducted at Outpatient Department at Yangon Children Hospital. The study period was from October 2018 to October 2019.

2.3. Study Population and Sample

Children who came to Outpatient Department at Yangon Children Hospital and needed to perform venipuncture procedure for clinical purpose were the study population.

The 124 children for both intervention and control groups were participated.

2.4. Sampling Method

Consecutive sampling was used in this study. The sample population was randomized by using randomization table. Computer generated randomized table was used for randomization of children into two groups.

2.5. Research Instrument

The participants were interviewed for the socio-demographic information by the researcher including about age, gender, race, and educational status of the child, type of caregiver presented at the time of venipuncture, previous experience of venipuncture in children and fear to venipuncture in children. The Faces Pain Scale (Revised) (FPS-R) was used to describe the self-report pain scores of the children during venipuncture. It has been employed in many different clinical areas and have been found valid in various acute care setting [9]. The FPS-R is shown to be appropriate for use in assessment of the intensity of children's acute pain from age 4 or 5 years and older. It has the advantage of being suitable for use with the most widely used metric for scoring (0-10), and conforms closely to a linear interval scale [10].

2.6. Pilot Study

The pilot study was done at outpatient department of Yankin Children Hospital with the number of 10% of sample population in order to test the applicability of tools and clarity and simplicity of the included instruments.

2.7. Data Collection Procedure

After explaining about the purpose and the research procedure, the researcher obtained informed consent from the legal guardians and verbal consent from children. The participants were interviewed the socio-demographic information by the researcher. The children in intervention group were explained about both cold application procedure and distraction procedure. Children in both groups were explained about the Faces Pain Scale-Revised (FPS-R) to point out a face after the procedure that reflecting his or her pain due to venipuncture.

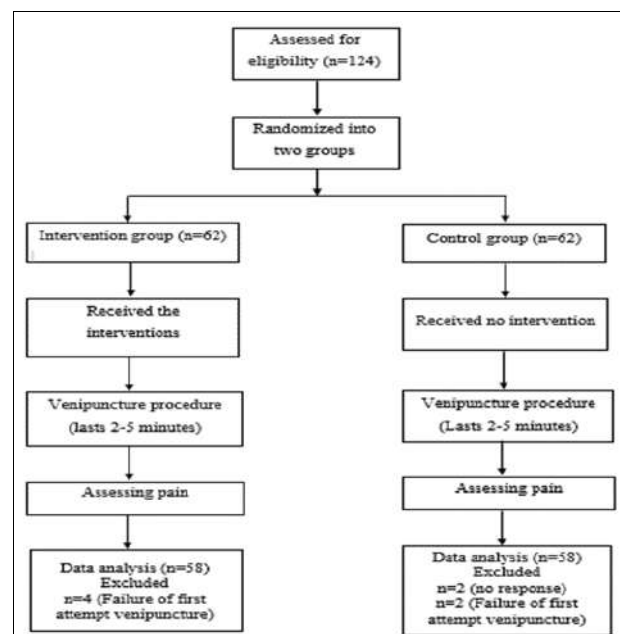


Fig 2: Flow chart of the study

2.8. Data Analysis

The data were calculated by using the Statistical Package for Social Science (SPSS Version 22). The eight children were excluded due to no response (2 children) and failure of first attempt venipuncture (6 children). The comparison of pain scores between the two groups were analyzed by using Mann-Whitney U test.

2.9. Ethical Consideration

The approval was obtained from the Rector and Ethics and Research Committee of the University of Nursing, Yangon. The study was continued under the permission of the administrative and authorized personnel of the study area. Researcher obtained the consent from each of legal guardian and verbal consent from children in the study. The guardian was informed about the aim of this study in terms of their participation and was given the information sheet and fully explained. Confidentiality and anonymity of the participants were ensured to protect the dignity of them.

3. Results

In this study, the socio-demographic characteristics of the children that presented are ages of children, gender of children, race of children, educational status of children, type of caregiver presented at the time of venipuncture, previous experience of venipuncture in children, and fear to venipuncture in children in both intervention group and control group. The p values were shown that there were no statistically significant difference in socio-demographic characteristics of the children between the intervention group and the control group.

As presented in table (1), most of the children (n=37) in the intervention group described the pain score '0' which refers to 'no pain' due to venipuncture. Only 2 children (minority of the group) described high pain scores in which one child expressed pain score '8' and one child expressed pain score '10' which refers to 'very much pain' due to venipuncture in the intervention group. In the control group, there were only 5 children (small group) described pain score '0' which refers to 'no pain' and most of the children (n=16) described the pain score '2'. The second majority of the group (n=12) responded pain score '10' which refers to 'very much pain' due to venipuncture. As shown in table (1), there were significant lower pain scores in the intervention group when compared to the control group.

The table (2) showed that there was strongly significant (p<0.001) between pain scores of the intervention group and the control group in order that p<0.05 was considered statistically significant. Therefore, the cold application combined with distraction have significant effect on venipuncture pain among the children. Accordingly, the combined intervention can have the significant effect of lower pain scores in children.

Table 1: Distribution of pain scores of the children in the intervention group and the control group

Self-reported pain scores of children by FPS-R	Intervention group (Mean±SD) (1.17±2.02)		Control group (Mean±SD) (5.17±3.39)	
	Number	Percent	Number	Percent
Pain Score 0	37	63.8%	5	8.6%
Pain Score 2	13	22.4%	16	27.6%
Pain Score 4	6	10.4%	9	15.5%
Pain Score 6	0	0%	8	13.8%
Pain Score 8	1	1.7%	8	13.8%
Pain Score 10	1	1.7%	12	20.7%
Total	58	100%	58	100%

Table 2: Comparison of pain scores in children between the intervention group and the control group

	Intervention group Mean Rank	Control group Mean Rank	Mann-Whitney U test	z score	p value
Self-reported Pain Scores by FPS-R	38.27	78.73	508.5	-6.71	.000***
*** - p<0.001 strongly significant					

As the secondary analysis, the relationship between the socio-demographic characteristics and the pain scores of children have been analyzed based on both groups. The selected socio demographic characteristics which age, gender, type of caregiver, previous experience of venipuncture and fear to venipuncture had been analyzed whether if there would have been related with pain scores of children based on both groups by using binary logistic regression.

Based on both groups, the odds ratio was 15.885 with 95% CI (3.197-78.939) and the p value was 0.001 (p<0.01) between the intervention group and the control group. The pain scores in the intervention group was over 15 times lower when compared to the pain scores in the control group.

Fear to venipuncture in children was associated to the pain scores of the children with the values (odds ratio=0.232, 95% CI (0.055-0.989) and p=0.048) when p<0.05 was statistically significant. There was a significant association between fear to venipuncture and pain scores of children in which children who had fear to venipuncture predisposed over 23% higher pain scores than the children when had no fear to venipuncture. The other socio-demographic characteristics of children were not associated to the lower or higher pain scores.

4. Discussion

Children perceived venipuncture as one of the worst painful procedure in clinical setting. In the present study, the children who participated in the control group expressed very much pain about 20.7% which were the one-fifth of the group. Only 8.6% of children in control group described no pain during venipuncture. This was supported by the previous study [7]. This study revealed pain perception of children during venipuncture represented that the majority of children (66.7%) expressed severe pain during procedure. The study concluded that venipuncture was one of the most fearful and pain aspects for the children and there was needed to establish the more effective technique for procedural pain management in children.

The present study revealed that cold application combined with distraction was strongly effective in reducing the venipuncture pain among children ((U=508.5; z=-6.71; p<0.001). This was consistently supported by the previous study [11] which showed the mean pain score in intervention group was 0.66 and of the control group was 8.93. The study revealed that there was significant difference between pain scores of children in intervention group and control group (t=24.817; p<0.01). The supporting conclusion to the present study was that cold application was a practical modality of choice and it promote comfort, cost effective and it is efficient when combined with distraction in reducing pain in children during intravenous procedure.

Another study ^[12] was also consistent with the present study, in which Faces Pain Scale-Revised (FPS-R) was used to assess the pain by self-reported, observer-reported and parent-reported. The results of this study supported that children self-reported pain score in intervention groups ((0.96±1.41), (1.44±1.3)) were lower than the control group (6.28±0.61). The study clarified that there were highly statistical significant differences between intervention groups and control group ($p < 0.001$). The study recommended that the use of buzzy and cryotherapy should be integrated as a part of routine daily care for managing needle puncture pain and anxiety during blood specimen collection.

The current study suggested that the combination of cold application and distraction during procedure have a strongly significant effect on venipuncture pain among children with the indication of $p < 0.001$. The study was supported by the previous discoveries ^[13, 14, 15]. These studies have shown that the combination effect of external cold application and distraction was effective to reduce the procedural related pain among children. The studies implied that combination of non-pharmacological methods of pain management represent a helpful way to lower level of needle related pain in children.

Another study ^[16] revealed that the combined intervention group of external thermo-mechanical stimulation and distraction have significantly lower pain scores (0.53±0.9) than the control group (4.46±2.9) by the children self-reported pain ($p < 0.001$). The study recommended that it can be used either during blood drawing procedure or during cannula placement procedure in children. The combined methods were beneficial in the minimizing the pain in children during the blood drawing procedure.

As to reinforce the recent study, a study was conducted by using WB-FPS and CFS with the age of 7 years old children during immunization¹⁷. Pain and anxiety evaluation before and during procedure in both experimental group and control group were evaluated in this study. Pain in the experimental group during procedure was low (1.38±1.92) when compared to the control group (3.42±3.10) with the p value ($p = 0.001$). The study showed that the combination effects of non-pharmacological methods was effective in reducing pain during procedure and therefore, it was efficient for management of needle related procedural pain in children.

Additionally, the present study was supported by a recent study of randomized control trial¹⁸ which revealed the combination effect of the buzzy that was system of external cold and vibration and the distraction via distraction cards showed a greater reduction of perceived pain than the comparison group. The researchers indicated that the combination of cognitive method of intervention by means of distraction cards and cryotherapy effect together with vibration was proficient in preventing and reducing the procedural related pain among children in order that underlined relevance components of non-pharmacological interventions.

Moreover, it was underlined that the multifaceted approach combining several techniques to prevent or reduce perception of pain according to age and developmental level of children ^[19]. The interventions used in the present study is in fact one of this multimodal approaches by means of combination of cold application and distraction which emphasized on non-pharmacological interventions to

prevent the procedural pain before, during and till the completion of the procedure.

Many studies have revealed that a large number of children do not receive adequate pain prevention during the procedures. If there was not taking consideration on the prevention of needle related procedural pain, several undesired effects can cause in the future. The cold application took some minutes and the distraction techniques via distraction cards must contain a specific involvement of an adult (whether nurse or parent) and the ability of the child to interact with the provider. However, compared to the complete absence of any form of treatment, the use of these interventions has shown efficacious in implementing venipuncture procedures by facilitating the child to reduce the perceived pain.

Children's perceived pain can either be related or not with the several issues on different situations from different points of view. The combination of these two interventions have shown that was an effective combination of non-pharmacological interventions to reduce the venipuncture pain in children with the strongly significant results. With these interventions, nursing personnel who dealing with pediatric pain can utilize the effective nursing pain management in children.

5. Recommendations

Nowadays, the care for the children are leading towards the atraumatic care. The children should be treated with the minimal trauma though the procedures are necessary to be done. Appropriate pain assessments, measurements and techniques are absolutely required in managing the pain in children and should be concerned in every pediatric health care institution. Moreover, the cooperation of the family is very important in managing the pain in children and further research of family-centered child care should be conducted. The simplicity, applicability, safety, cost-effectiveness and possible benefits of the combined intervention in this study should be one of the utilizations in management and prevention of pain among the children. It was also adapted to the developmental level of the child. Although using these intervention needs more time than routine care, its advantages which impact on pain intensity and perception of pain in children are much effective in reduction. Even though distraction methods during procedure require one more person, the technique can also be easily done by the caregivers who present at the time of procedure and then it will make more applicable for the children. Further randomized controlled trial studies should be conducted and are needed to compare the different types of non-pharmacological methods of pain management in children.

6. Conclusion

Pain in children can be preventable although painful procedures may not be avoidable. The present study had shown that the appropriate combined methods of non-pharmacological pain management techniques are simple, easy, unexpansive and effective to use in clinical practice providing the physical and emotional comfort in children. The study revealed that the combination of cold application on site of venipuncture before intervention and distraction during venipuncture until the end of the procedure had the strongly significant effect on prevention and reducing the pain from venipuncture among children.

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